The *Bersila* Workstation:

A New School Furniture Concept

by

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Signed statement of originality

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Abstract

In a period of globalization *bersila* practice has gradually begun to change as the modern form of seating has been introduced into the home, the school and the business environment and a more western approach to seating has been adopted.

This research project investigates the developing of a body of furniture that takes into account the typical Malaysian sitting position called *bersila* or the cross-legged sitting position, which is common in most Asian cultures. The aim of this project is to foster the continued use of *bersila* particularly amongst young Malays. The early formative years of schooling were chosen for the development of a versatile workstation design to facilitate the *bersila* sitting position, identified as the *Bersila* Workstation: Kindergarten and the *Bersila* Workstation: Primary.

Although chairs have been marketed to suit the Yoga sitting position, a kindergarten and a year one workstation to facilitate the *bersila* position is without precedent. In order to ensure that the workstation can be used in early schooling, a number of design criteria must be applied. These include:

- Suitability for low cost mass production
- The use of economic materials
- Robust construction
- Ease of manoeuver and stability
- Safe handling by young people
- Flexible use to suit various classroom activities
- Flat packing to aid distribution.

The significance of the project is its tangible contribution to Malaysian culture. The *bersila* sitting position is a part of Malaysian and other Asian cultural identity as well as having ergonomic and life style benefits. In a world where globalization promotes conformity the early encouragement of *bersila* sitting in school will assist in encouraging the practice.

This project outcome is an example of finding a design solution to meet cultural and lifestyle needs. The tangible results are two workstations that are suitable to the growing needs of kindergarten and primary school students. The furniture ideas have been tested in Malaysia and Australia schools, and the outcomes of the research demonstrate that the research project has the capacity to be introduced widely in the Malaysian education system at the same time as creating a versatile and flexible seating system at an important formative time in children's development.

Malaysia is situated at the centre of a billion strong populations in a group of nations with a climate of economic growth due in part to the rising middle class. This indicates a demand for larger furnished homes. There is status implied in furniture and particularly in seating. However these populations also have long standing traditions that include the *bersila* seating position which suggests a potential to cater for both *bersila* and Western sitting. This project heralds a direction for the region in furniture design that combines both functional and cultural criteria.

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INTRODUCTION TO THE IDEA: THE *BERSILA* WORKSTATION

The central idea of this research project is to assess the feasibility of combining a traditional South-East Asian seating position with contemporary forms of educational furniture. The premise is based upon a regularly invoked Malaysian phrase: 'Melentur Buluh Biar Dari Rebungnya', which means that to create a good or better future, we must do it from the root. It is related, of course, to the increasing use of modern furniture in Asia as a growing middle class develops in the region. The project is based on the problem of developing furniture that assists in the retention of the *bersila* sitting position and I have focused in this research project on the formative years of a child's development because the earliest period of schooling is known to form lifetime patterns. This group of students will become the community trendsetters of tomorrow.

In order to successfully capture the enthusiasm of the children and teaching staff, the designs have had to be functional in the classroom and enjoyable for children to use. Once the designs had been developed to a reasonably sophisticated level and ethics approval had been obtained, it was planned to carry out trials employing school children in kindergarten and in early primary school. As will be described, these trials were carried out subsequently in Malaysia and Australia during the three-year research period. As I will demonstrate, chairs are marketed to suit the Yoga sitting position, but a kindergarten and a primary school workstation for this sitting position is without precedent and I have outlined in the Abstract, a number of design criteria need to be addressed. These included:

- Suitability for low cost mass production
- The use of economic materials
- Robust construction
- Ease of manoeuvre and stability
- Safe handling by young people
- Flexible use to suit various classroom activities
- Easy for storage and for distribution.

I set out to use materials and methods of manufacture that could be suitable for a large test of the concept in timber although I am aware that when it comes to a really substantial process of mass production the use of plastics may be the viable option. As I have sought to demonstrate later in this exegesis, my use of timber in this research project has been a deliberate choice based on economic, climatic and aesthetic decisions.

I have always been interested in the woodcrafts and wood design, and learnt from an early age the fundamentals of working with wood to produce basic furniture. After completing a Diploma in Electronic Engineering, I went on to complete a degree in Industrial Design at the MARA University of Technology (UiTM). Here I was exposed to the principles and elements of design. During my study at MARA University of Technology, I produced three furniture designs, four product designs and two transport designs. The first furniture design was a kitchen counter stool, using the idea of *pucuk rebung* (bamboo shoots) as the principal design motif. Bamboo shoots form an integral part of Malaysian cuisine and I wanted to express the idea of the stool's function as an object that was used as part of the ritual of eating. I used pinewood and tubular steel as the material and the motif of the bamboo as the design element. The next project was a design for a sofa and I was particularly interested in developing an object based on the ways in which I observed people in Malaysia using such a piece of furniture. This led me to come up with the idea of a 'half-moon' design that allowed for considerable flexibility in the way in which one chose to sit on the sofa. Finally, I designed a podium for a sporting event and again incorporated the half-moon concept, this time to produce a portable, stackable and easily stored furniture item.

One of the key questions that emerged from my undergraduate design studies – and this was something that I discussed at length with my peers – was how to design furniture that might reflect aspects of Malaysian culture and society[1]. We looked for instance, at ways to incorporate the *Keris* (the traditional Malay weapon), *Perahu* (traditional boat), *Tepak Sirih* (traditional box for keeping betel leaf), traditional musical instruments and so on into various design.

[1] Susan J. Wolff. "*Design Features for Project-Based Learning*." 2002.

This has been a continuing concern in my design and has led me to begin to think about how one might successfully incorporate a key aspect of Malay culture, its traditional seating position, *bersila*, as a fundamental concern when developing particular items of furniture.

CHAPTER 1: INTRODUCTION TO *BERSILA*, THE CROSS-LEGGED SEATING POSITION.

This research project has focused on developing a body of furniture for children in everyday learning activities, which features a key aspect of Malaysian identity: the cross-legged seating position or the *bersila* position. The target of this research is to encourage children[2] to practice the cross-legged sitting position in the traditional way and to develop furniture that reflects the important aspects of Malaysia culture. If we compare today with twenty years ago, children now spend significantly more time sitting and we know they are less active, which may present many drawbacks for them. Movement is necessary and beneficial even while sitting (Breithecker, 2009). With this idea in mind, I have set about developing a new furniture concept that can enable them to sit longer and to move in whatever position they like[3].

Fig. 1 - *Bersila* or Cross-Legged sitting position.

Bersila or the cross-legged position is the typical Malaysian sitting position, which is common in most Asian cultures. It is the seating position that offers the most stability, with three points touching the ground, creating a tripod effect. According to the *Dewan Bahasa dan Pustaka Dictionary*, *bersila* means a

[2] H. Hendy and B. Raudenbush. "*Effectiveness of Teacher Modeling to Encourage Food Acceptance in Preschool Children*." Appetite 34.1 (2000): 61–76. Web. 15 Feb. 2013.
[3] H. Shahnavaz. (1987). *Ergonomics of developing countries: Do we need a different approach?* Proceedings of the International Symposium on Ergonomics in Developing Countries. pp. 53-8. Geneva: Publications of The International Labour Office.

form of a sitting position: on a cushion, a mat, carpet or rug, where the sitter bends the left leg and places that foot in front of abdomen, and then bends the right leg and place the right foot on top of the left foot so that the feet cross each other; it emphasizes core body strength because the position keeps the spine straight.

This *bersila* practice, however, has gradually begun to change as the modern form of seating has been introduced into the home, the school and the business environment and a more Western approach to seating has been adopted. Nevertheless, even though modern furniture is widely used in these situations, one will often find Malaysians and Indonesians sitting on chairs, for instance, in the *bersila* position.

My idea is to bring this traditional seating approach into the contemporary domain with designs that suit younger taste so that new generations may continue to practice the traditional seating culture.

Malay Cross-legged Sitting Position in Many Situations

In Malay society, sitting in the cross-legged position is an inherited practice with an exceptionally long history. Malay communities have held fast to this tradition because of its impact on all aspects of life. There are several significant reasons why the practice of *bersila* was adopted. One reason relates to the size of traditional Malaysian houses, which are generally quite small and this has caused Malaysians to choose to minimize the use of furniture. Space is used as much as possible for a variety of purposes and the space will have multiple uses including for sleeping, for socializing, for prayer and for eating; and in each case the minimal use of furniture makes the space more flexible[4].

[4] B. V. Wijnen. "*Malaysian House*." Web. 4 Jan. 2010.

Fig. 2 - Dignitaries would sit cross-legged facing the Sultan.

In Malaysian society seating position has played an important part in the social hierarchy as well. In the image above we can see the Malaysian Sultan seated on low chair on a raised dais and clearly seated above the others depicted in the image. Dignitaries would sit cross-legged and slightly elevated on pillows at the left and right of Sultan (Fig. 2). Those Malaysians of lesser status sat cross-legged facing the Sultan; servants and guards would stand[5]. Typically, in traditional Malaysian culture, only the Sultan sits on a chair or something higher and this was a clear representation of status. To stand directly in front of the Sultan during an audience would be considered rebellious.

Fig. 3 - Village people sitting on the floor while having meeting.

This next image in Fig. 3 depicts a relatively low-income group of Mali fishermen. The main cheap material for housing construction will be wood. Typically, because of Malaysia's high rainfall, houses will be raised on stilts in the fishing villages because of the potential for flooding. The height of the floor from the ground varies between houses and will depend on the owner. Furniture

[5] K. A. Mastor, P. Jin, and M. Cooper. "*Malay Culture and Personality: A Big Five Perspective*." American Behavioral Scientist 44.1 (2000): 95–111. Web. 5 Jan. 2013.

will be kept to a minimum; cleanliness is a priority and each home will provide a pot of water to wash the family's and visitors' feet before entering the house, to ensure that they do not defile the floor[6]. To provide comfort when sitting on the floor, most of the houses in traditional villages will use a straw mat to line the floor and it is also has an aesthetic or decorative role.

Fig. 4 - Ladies will be gathered to prepare the food in sitting cross-legged.

The situation seen in Fig. 4 is of a tradition that stretches back for generations in Malay communities, and even today there are houses that adopt the principles of traditional houses, and the activities and behaviours that go with those principles, such as sitting cross-legged. Here we see in Fig. 4 an example of women preparing food; while the men may be cleaning the village area, women will be gathered together to prepare and provide food and to do this activity, a broad space is required for them to carry out their tasks. The kitchen area should be clear of any furniture so as to give space for everyone to be seated cross-legged on the floor while preparing the food.

While carrying out this activity they will be mingling because at this point they will be sitting cross-legged and all of them will be able to see each other. Similar situations occur on important occasions such as the celebration of a newborn baby and the baby hair shaving ceremony. So far, visual examples have been given that show common moments when men and women will be seated naturally or formally in the cross-legged position.

[6] M. S. Lailawati. "*High / Low Context Communication: The Malaysian Malay Style*." (2005): 1–11. Print.

They range from political examples where Malaysians meet in situations that highlight the social hierarchy in Malaysian culture; and others where they carry out everyday tasks such as preparing food; and others where groups come together to socialize or to celebrate important family events.

Fig. 5 - Reading a Holy Quran in cross-legged.

In this image (Fig. 5), although in the modern age there are many types of furniture such as chairs and tables in use, the practice of sitting cross-legged still continues during a reading of the Holy Quran. Book-rest boards (Papan Rehal) or pillows are used as a support for Holy Quran while sitting in the cross-legged position so that the Holy Quran will be at the right level and can be read at a comfortable reading height. On average, the activity of reading the Holy Quran can go on for up to an hour and in order that the readers do not have to bend, this arrangement provides comfort to the readers. Sitting cross-legged is still practised for teaching the Holy Quran and adopting the cross-legged position makes it is easier for teachers to monitor students' reading.

Fig. 6 - Marriage proposal in Malay culture, where both families sit together for discussion.

In Fig. 6, we see an aspect of a Malay Muslim wedding ceremony. There are several stages to this important event beginning with the ‘spy’ that the male will send as his delegate to meet female family members in order to propose marriage. Typically this will be carried out according to customs where close relatives of the man act on his part; the ‘spy’ can be say, the mother or uncle. They will sit cross-legged together in the living room that will be just covered with a mat or carpet, and they will sit opposite each other with delivery trays between them. Upon completion of the event, food will be served to members of the group and they will eat in a cross-legged sitting position.

After these discussions, the elaborate engagement ceremony will be held; this is followed by the equally elaborate wedding solemnization and celebrations. The man will be represented by a member of his immediate family and by relatives for engagement ceremonies. During the day, the feast will be held in conjunction with the engagement at the girl's house. In this feast the man’s family members will be intimately involved in the ceremony and, once again, the ‘getting together’ of the two families will involve the traditional sitting position.

Fig. 7 - *Akad Nikah* or Solemnization of Marriage normally done at mosque and carried out by the ‘Tok Kadi’.

The solemnization of marriage or *akad nikah* (marriage contract) is the most important event in the Malay Muslim wedding and again the *bersila* position plays an important part in the ceremonies. Solemnization can be done in a mosque, in the office or even at home and carried out by the *Tok Kadi* or priest. In solemnization, there will be three witnesses and the bride’s father will be on of the witnesses. Sometime the bride’s father can act as *Tok Kadi* and he can marry his daughter, although it is more common for a *Tok Kadi* or priest to officiate.

In the Mosque, chairs and tables cannot be used in the prayer area and all attendees will sit cross-legged on the carpet: only the groom will sit on the lined pillow. In this ritual the male audience will be seated separately from the bride's audience because according to deontology in mosques men and women are not allowed to sit together. Usually while waiting for the groom, the ceremony called *berzanji* or the 'shot drums' is held. This ceremony is usually performed while seated cross-legged. Next the groom will sit cross-legged on a piece of mat in the middle of the ceremony and will clearly affirm the contract. The groom need to pledge the contract loudly so that the three witnesses can hear the contract and if one of the witness can't hear the groom's voice during reciting of the contract, the groom must recite it once again.

Fig. 8 - The Malay newlyweds on *pelamin* during wedding ceremony.

The actual wedding day is the *bersanding* which means sitting together. It is the highlight of the wedding ceremony and the bridegroom and bride are called the king and queen for a day. Newlyweds will sit on raised thrones, which are beautifully decorated with various kinds of flowers and decorations. Now there are all kinds including the use of stages covered with pillows where the groom will sit cross-legged while the bride will sit in the *bersimpuh* position[7]. Seating beside the newlyweds will be a bridegroom and a bridesmaid who assist the newlyweds.

[7] The term *bersimpuh* describes the female seating position where both legs are folded back under the body and is used when the need for decorum requires it. Dewan Bahasa dan Pustaka, Fourth Edition, (2005).

Based on this background survey I have attempted to show that throughout Malaysian history communities have used the cross-legged sitting position in almost every activity of waking life, whether it be social, political, religious ceremonial or practical. As a result of these activities, the practice of sitting cross-legged has been the usual practice to all classes in Malaysian society. Whether consciously or not, they will sit in the cross-legged position, regardless of the place, whether it's on a chair while working or studying, in the car, in a field. This clearly demonstrated cross-legged sitting position is part of the main cultural practices adopted by the Malays in Malaysia.

Indonesia

Fig. 9 - People sitting in cross-legged position during having dinner in an Indonesian restaurant.

In Indonesia the characteristics of indigenous culture are very similar to those in Malaysia. Similar food preparation and eating habits occur and although sometimes Indonesian food is served and eaten off the table, usually it is eaten on woven mats covering low platforms or on at the ground. This eating style is common in Yogyakarta, Central Java, West Java and even in Sumatra. There are many restaurants that provide dining rooms where customers can sit cross-legged if they want a meal, and this also occurs in Malaysia. The dining room will provide a low table about hip level while sitting cross-legged, and the floor will have a cloth with a woven mat to protect diners from the wooden flooring splinters. Some restaurants will provide cushions for seating comfort to customers who rarely sit in the position or are not familiar with the cross-legged sitting position. Shoes are removed before entering the dining area.

Fig. 10 - A craftsman sitting cross-legged on the floor while making a craft.

For comfort and convenience when working with their craft most of the traditional craft makers usually undertake these activities in their houses. The craft makers come from traditional villages where they have hereditary skills. Their workspaces are usually located in the basement of the house and some houses have a very low ceiling. This again makes the *bersila* position a practical one, especially where there is little furniture and perhaps just one small table on which to stand their products.

Fig. 11 - Preparation for celebrating 'Galungan' Festival in Bali Indonesia.

Like Malaysia, social activities regularly occur outside where villagers will sit together on the ground. This is especially the case with wedding receptions and other celebrations where the whole village community carries out the social activities and even though, nowadays, there is a decrease in involvement of young people due to the migration to the city, this activity continues to occur in times of festivity.

Referring to the above picture, the village community has gathered to celebrate their faith and they will produce essential goods for the festival, including woven pandanus. They come together and while weaving pandanus, they will also be seen joking and adopting various comfortable sitting positions according to their preference, some keep their feet straight, some are sitting in the *bersimpuh* position and some are sitting cross-legged.

Fig. 12 - Barong Dance, the actors adopting the cross-legged position for a substantial period of the performance.

Fig. 13 - People of Bali celebrating Eid Galungan.

In Fig. 13 we can see the ceremony know as Eid *galungan*, a Balinese-Hindu ceremony of worship for the victoy of dharma (virtue) which is central to the Hindu belief system. The picture shows how the *galungan* festival is celebrated by the people of Bali and from here it also shows how they all will sit in the cross-legged or the *bersimpuh* seating position while performing the ritual. Normaly men will sit cross-legged on the floor while the women who are wearing traditional clothes going to will sit in the *bersimpuh* position. Each home will provide a dish of food such as fruit, cakes, flowers and all these dishes will be placed with *penjor* (a tall bamboo splendidly decorated with woven young coconut leaves), and this decorattion will be offered to god. This festival will last for ten days and at the end of the festival they will celebrate *kuningan* as the ceremony ends.

Thailand

Fig. 14 – Meal served on floor.

Architectural structures of houses in rural areas are more or less similar in Thailand as they are in Malaysia; this is probably due to the similar climate and because there are many similar customs. Most of the village houses have minimal furniture as happens in Malaysia and the use of straw mats and bamboo mats also applies to Thailand. Much of daily life occurs in the living room or the main room in the house, and most houses will use mats and some houses provide a small versatile mattress that can be folded into a triangle and used as a place for rest or even a bed. In rural Thailand, there is basically a similar lifestyle to that in Indonesia and Malaysia, and this is true too of their traditions. Usually the evening drink or eating activities will be held in huts near their homes or on the house balcony. Meals are served within the seating area covered with bamboo or straw mats and as can be seen in Fig. 14, no furniture is used. If the activity involves guests who are not familiar and comfortable with such sitting positions, pillows will be provided for extra comfort.

Fig. 15 - Bang Khu Wiang Floating Water Market.

A huge range of activities are carried out sitting in the cross-legged position and can be seen everywhere around Thailand. Most of the traders who trade on the pavement or the road, choose to sit cross-legged on a platform covered with woven mats or matting bamboos. They will organize their sales items in front of them either in containers or placed on the ground and this depends on the type of sale. In the case of the traders of the Bang Khu Wiang Floating Water Market, the Taling Chan Floating Market and the Kha Foating Market, they use their boats as stores and they sit cross-legged on the boat while rowing because this position is easier for them to balance the boat's position .

Fig. 16 - A group of Thailand traditional instrument players performing.

There are various kinds of traditional musical instruments in Thailand such as the Ranad Ek (percussionist instrument), Khawng Wong Yai (circle of gongs), Ching and Chab, and traditional instrument players will sit cross-legged on the floor or on a special platform which has been prepared. When playing the music equipment, a player is required to sit cross-legged, and sometimes a player will just sit *bersimpuh*. At one time the instruments were only played for kings and dignitaries, which is one reason why all musical instrument players were not allowed to stand: as with Sultan of Malaysia, the player will be in a sitting position in order to honor the king. As in Fig. 16 demonstrates, the tradition is being maintained in contemporary seating. As explained before, the design structure of the village house in Thailand requires minimal use of furniture, and this will be one reason why traditional musical players usually practice on the floor at home or on a platform near their homes, and sometimes there is a specific area designated for them to practice together-usually a yard where they will sit on mats on the ground.

India and Pakistan

In this section I will focus on the people of India and Pakistan practising sitting cross-legged in daily activities. India is a vast country and has a wide variety of communities and there are many religions practised[8]. India has the second highest population on earth with huge numbers concentrated in the 10 major cities - Calcutta, Chennai, Greater Mumbai, Hyderabad, Delhi, Chandigarh, Mahe, Howrah, Kanpur City and Bangalore.

Fig. 17 - Public Transport in India.

The effects of population density can be seen everywhere: in the image from Fig. 17, an overcrowded bus carries a large number of people who seem unperturbed either with the discomfort or the danger, some sit cross-legged, some are half-squatting sitting on the bus roof and some cling to the doors of the bus. This kind of environment is a common picture in India. The common cross-legged sitting position has been adapted within their daily activities and so in this case sitting with that position on the bus roof has become habit.

[8] T. K. Oommen (1990), *State and Society in India; Studies in Nation-Building*. New Delhi.

Fig. 18 – Woman sitting in yard.

Fig. 19 - Students sitting on the floor during learning activities.

Figs. 18 and 19 show situations in which the cross-legged seating position is adopted in India. As with Malaysia, Indonesia and Thailand, traditional village living is relatively simple and in India there is also the minimal use of furniture[9] and sitting on a mat on the floor is often preferred. All familial activities, eating, resting and socializing will occur in the living room where they will sit on a layer of woven mats[10]. Similarly, in many schools in rural areas, they do not provide basic amenities such as tables and chairs. The students will sit on the floor during learning sessions and in this situation, whether they are boys or girls, they will need to sit cross-legged. If they want to do writing they have to bend down their body because there is no appropriate table or pedestal available for such activities.

Fig. 20 - People doing prayer.

[9] D. Chakrabarti. *Indian Anthropometric Dimensions for Ergonomic Design Practice*. Ahmedabad, India; NID Publication. 1997.

[10] British artists in India during its long colonial rule showed Indians sitting on the ground in a variety of attitudes for many different task and social occasions – P. Pratapaditya and V. Dehejia, *From Merchants to Emperors: British Artists and India, 1757-1930* (Ithaca, NY: Cornell University Press, 1986)

In this image (Fig. 20) of prayer (*poja*), all are seated in a cross-legged position. Here visitors will sit cross-legged facing the deity statues located in front, while the priest leader will sit down in front of the audience. This cross-legged sitting position standard practice in the temple.

Fig. 21 - Marriage Monk begins ritual in Marriage Ceremony.

As with the prayer, above in Fig. 21, so with wedding ceremonies that are held in the temple. We can see from this image those people are sitting cross-legged on the floor and by looking to the image, we can see the newlyweds, family and marriage monk or interpreter will sit facing a holy fire (the container with fire) to begin the ritual. In Hindu marriage ceremonies there will be many elaborate rituals, and the most important ritual is *saat pheere*. In this ritual the newlyweds will need to go around the holy fire 7 times while the priest chants the holy mantras. They believe with every step they make, that they will have blessings from the god. To do the *saat pheere* normally in this ritual they will have a *shehnai* (musical instrument) sound with it.

Fig. 22 - Indian people singing and dancing to celebrate *Mehndi Parti*.

Fig. 22 shows a *mehndi party,* one of the rituals in marriage ceremony, and in this ritual the bride's friends and family members will paint themselves with henna decorations in their hand and feet. They believe if they want an essence of love, it must come from the color of *mehndi* ritual. They mainly celebrate this ceremony with singing traditional songs and dancing, and the entire musicians' ensemble will be sitting cross-legged on the floor playing their instruments and wearing brightly coloured clothes with a similar pattern. The sitting position gives the musicians balance. It is not without interest that the great Indian leader, Mahatma Ghandi chose, where possible, to sit in the cross-legged position as a political and social gesture - rejecting the modernism of the 'chair' in favour of emphasizing the importance of retaining traditional culture[11].

China

In this section I will discuss some of the ways in which the cross-legged position is used in China. My first example in Fig. 23, is an illustration of a painting from the Song Dynasty (960 - 1279)[12]. It is a work by the court painter, Ma Hezhi[13] that represents a scene in an enclosed garden. A nobleman and his wife (or courtesan) are seated cross-legged on a dais in the garden. They are drinking tea and admiring the beautiful surroundings and beside them is their daughter-in-law who attends to them. All are depicted below the dais, standing near to the couple. The main subject of the painting is the relationship between the nobleman and his wife and their young son, who kneels in front of the dais with his head lowered as a gesture of respect to his father. The dais is exquisitely carved on the sides of the platform; three screens, decorated with landscape scenes, shield the couple from the wind at their backs and on the sides. The painting gives us a valuable record of one way in which the cross-legged position has been adopted over a thousand years ago.

[11] G. Cranz. *The Chair: Rethinking Culture, Body and Design*. New York: W. W. Norton & Company, 2000. p. 29.
[12] J. K. Murray. *Ma Hezhi and the Illustration of the Book of Odes*. United State of America: University of Cambridge, 1993.
[13] G. G. B. Guan. *Songdai Shuhua Ceye Mingpin Techan*. Taipei, 1995.p. 44.

Fig. 23 - "Illustrations of the Classic of Filial Piety," From Ma Hezhi.

Another historical example is from the late nineteenth century (Fig. 24), it is a photograph of a traditional Chinese family seen seated on a raised section of the communal space of their house[14]. It looks to be a place that has a variety of uses: here the adult couple appears to be engaged in some kind of craft work – perhaps the creation of silk clothing or covers – but, as is the case in Malaysia, Indonesia, Thailand and India, it is likely that the same space was used for eating and sleeping. The raised section of the room appears to be formed on a hollow brick base. There is a door on the side of the platform, which probably allowed the family to place hot charcoal or coals within, in order to heat both the room and the platform itself. It appears to be the only form of seating in the room but is, nevertheless a comfortable and practical working and living space.

In China today, the typical manner of eating is at a large round table. Usually Chinese foods are served with many dishes on the table at one time and they will eat rice together with the Chinese dishes on the table. If there are many people, normally they will use a round table and it makes more sense for that because each person can pick up the food easily from any direction[15]. However the Fig. 25 shows only two men and that might be the reason why they are using a lower square table and just sit cross-legged sitting position.

[14] K. Carr. "*Inside Ancient Chinese Houses*." Web. 3 Jan. 2013.

[15] K. Bodil. "Everyday Furniture of the People of China." *Mobilia* 1980: pp. 41-45.

Fig. 24 - Group of Family Sitting on a K'ang bed in the 1890s.

Fig. 25 - Dishes were served on low table.

The Chinese habit of cross-legged sitting is not just confined to the activity of eating but can also be seen in other daily activities[16]. In Fig. 26 we can see how two men play Chinese checkers with one sitting cross-legged on a bench. The man is finely balanced on the seat and has a folded cloth on which he is sitting – partly for comfort and partly as a shield to the dirt. In Fig. 27, we can see the street traders on a village street in China are adopting this sitting position. All their merchandise will be put into baskets in front of them and most of them are comfortable with sitting cross-legged on the piece of paper or cloth. The reason for not sitting on a stool maybe, is because they have to walk or cycle from their place to the market and they need to carry their merchandise, so they have to minimize the things to carry.

Fig. 26 - Two men playing Chinese checkers.

Fig. 27 - Vegetable sellers in a Chinese village market.

[16] "*Brief History Chinese Furniture*." Web. 13 Feb. 2013.

Fig. 28 - Tibetan students learn the Thangka painting skill in a classroom.

Fig. 29 - Discussion activities between teacher and students in the Thangka Center.

In Fig. 28 we can see an example of a classroom in a school in China where students are sitting cross-legged and are using a low table, while in Fig. 29 we can see the students sitting cross-legged on the mattress while teacher sits on the floor using the mat as lining. All are using their knees and thighs as makeshift tables.

Japan

Fig. 30 - Japanese people having tea.

Like China, India, Malaysia, Indonesia and Thailand, Japanese society also has a culture of sitting cross-legged either when drinking, eating or socializing. There are two famous kinds of sitting for Japanese society: the first is *seiza* (kneeling on knees with legs tucked under) and *agura* (cross-legged). *Seiza* is a formal sitting position for the Japanese in any gathering and when the greetings have been made, they may allow the gathered people to sit in the *agura* sitting position. However only a man can be seated in the *agura* sitting position. It is not for women, which would be considered bad manners.

Usually small-scale banquets or meetings will be held in special rooms like the ones in the above picture. The room provides a low long table and all the dishes are served concurrently and cover the tabletop space. *Tatami* mats (woven rice straw) are not only use as floor coverings but also as an interior identity for Japan society. Guests sit cross-legged on a pillow, which will also cover their backs to give comfort while sitting cross-legged for a long time.

Fig. 31 - Zen meditation in Zen Contemplation Hall.

Fig. 31 shows the traditional Japanese practice of sitting cross-legged in *zendo* or the Zen Contemplation hall. In this *zendo* we can see there are two sides of people sitting cross-legged facing each other, on one side are the Zen monks and on the other side are laymen. It is seen they are carrying out meditation or Zen and these activities are done in a room or in space that is quite extensive. The monks are sitting cross-legged on the long platform with a *tatami* mat and the laymen are sitting cross-legged on the pillow for extra support.

Fig. 32 - Ozabusan the Cross-legged Sitting Cushion.

Fig. 33 - Modern Japanese cross-legged chair for sitting in the cross-legged position.

Because of the Japanese seating habits, many furniture companies produce furniture to accommodate this behaviour. In the images above (Figs. 32 and 33) we see the kind of portable furniture in modern Japanese houses. In the first image the man is using his computer while sitting in the cross-legged position; he is using a square cushion to support his back and his ankles. This cushion, will give him comfort while he is working for a long period in this sitting position. He is using a small table and the table has castors so that it can easily be moved for storage.

There is a lid for the computer table and it can be folded, in order to keep the computer inside the table. In Fig. 33 the man is sitting cross-legged on a chair, and from the image we can see the man is really comfortable while reading. This design has a backrest, armrest and a cushion. Its versatility and the fact that it facilitates the cross-legged position make it an excellent example for the purposes of this investigation.

Other International Examples

This concludes the brief survey of cross-legged seating in a range of Asian cultures and particularly of Malaysia, which is the primary focus of this research project. I will finish with some observations about Islamic culture more generally but I have, however, included several further images that provide evidence that cross-legged seating is not limited to Asia. With this in mind, I have selected a contemporary image from the Middle East and several from a number of Western countries in order to underline the point that this seating position is not limited to Asian society. The images include a rather amusing one of a Bedouin, his laptop and his means of transport, his camel.

Fig. 34 – A Bedouin man sitting in front of a laptop near a camel.

In Western society the cross-legged sitting position has been called Turkish-style and it is also called tailor-fashion or tailor-style. Westerners have practiced cross-legged sitting for many centuries, but in recent times it has been replaced increasingly by the use of chairs[17]. Fig. 35 provides a lovely portrait of a Western tailor sitting cross-legged on his work-table. Although there is furniture in the room such as a work desk and a chair, the man has chosen to sit cross-legged on his table while doing needlework. This may be due to the cross-legged position being more comfortable when sewing because with this position, the cloth can be placed on the leg while the arm is supported by the thigh; this may reduce any pain in the arms if one is doing tailoring for a long period.

Fig. 35 – This position known in several European languages as Tailor-Style

[17] G. Cranz. '*The Chair: Rethinking culture, body and design*'. (1998), P. 29.

In the following illustrated section (Figs. 36, 37 and 38), I have included three further contemporary images that show younger people finding cross-legged seating positions while using different item of furniture:

Fig. 36 - The Sitting Room (Francis Place) 111 by Sarah Jones.

Fig. 37 – A girl sitting cross-legged on office chair.

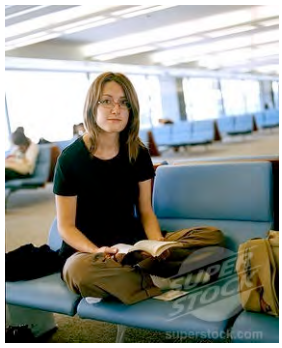

Fig. 38 - A women sitting cross-legged on couch at the airport.

Islamic Culture

In this section, I will finish with a brief discussion of the revitalization of Islamic culture particularly from the vantage point of a Malaysian perspective. For Muslim societies people are encouraged to follow all the behaviours and practices of the Holy Prophet Muhammad, and this includes following the way in which he ate and sat. This is taught to generation upon generation through the learning of the *hadith*, the expression of values attributed to the prophet, Muhammad. There are references to the prophet Muhammad sitting in the cross-legged position while at rest waiting before the time to start the next activity. It becomes a model and, for instance, when reading the Qur'an, Muslims will adopt the cross-legged seating position in respect for the prophet. In mosques there will be no chairs, and people sit cross-legged on carpeted floors[18]. Carpets do more than protect the knees, giving comfort to the face and hands while engaged in prayer.

[18] G. Cranz. *The Chair: Rethingking Culture, Body and Design*. New York: W. W. Norton & Company, 2000. p.27.

For the Islamic community, the mosque is not just a place of worship but it is also a place for various other activities that enable the believer to get closer to God. Among the activities carried out are teaching and learning how to read the holy Qur'an. For this activity the teacher and students will sit cross-legged while the Qur'an will be placed on the book-rest boards or a pillow, and some will use a prayer mat as in Fig. 39.

Fig. 39 - Child using a prayer map to place the Qur'an while he is sitting cross-legged.

Other activities that are carried out in the mosque include the religious lectures that will usually be presented by religious intellectuals and where the attendees will listen while remaining seated in the cross-legged position. This activity will typically last for an hour or more and the attendees are also allowed to change sitting positions if necessary. Similarly, when at the Friday prayer sermons and prayers of Eid, attendees will sit cross-legged on the carpet and the preacher will stand on a higher platform facing the attendees, so that the audience can see and hear the sermon clearly in this situation.

Fig. 40 - People reading the Qur'an inside the mosque.

Conclusion

It is within the general context outlined above that, this research project has been developed and in particular, the specific context of contemporary Malaysian society. As I have shown, the *bersila* seating position remains an important cultural, religious and social phenomenon in Malaysia and one that has many health advantages. The project investigates how this phenomenon might be encouraged in a time when global pressures and consumerism promote a Western style of seating that pays little attention to a form of seating which continues to have significance in societies such as Malaysia.

CHAPTER 2: CONTEXT

Related Design Practices

In this chapter, I will discuss the development of my new concept for school furniture. The inspiration for this idea comes from seeing people using a variety of seating positions when sitting in chairs. This is especially the case in South-East Asia where people commonly sit in the *bersila* or cross-legged position. Although chair designs are often developed to cater for specific seating positions, the user will use it according to their convenience.

As I have shown in chapter 1, seating in the cross-legged sitting position is commonly used regardless of where people live. Based on this premise, I began to look at designs of furniture that are based on the cross-legged sitting position. There is a significant range of chairs that have been produced for users who sit cross-legged, but mainly these are designed for the purpose of meditation or yoga. For the most part, however chairs specifically designed for yoga practitioners are not also suitable to be used as an education workstation although the Sukhasana chair produced by Carl Brodeur and the Soulseat chair by Pack Matthews do cater for this kind of idea. When comparing these two designs, there are several differences in way the concept of sitting cross-legged design is applied.

Among yoga practitioners, there is the cross-legged sitting position known as *Sukhasana*, and with this in mind Carl Brodeur has produced the *Sukhasana* chair in 2003. According to Brodeur, the goal of *Sukhasana* is to encourage spinal alignment in a perfect sitting position, and to ensure that consumers will feel harmony mentally and physically while carrying out meditation either at home or in the office. He believes that the correct sitting position will inhibit back pain and it will improve the mind. He designed the S*ukhasana* chair with three different sizes and controls that allow the sitter to find the correct body support through tilting and adjusting the seat height to tally with the size of the user[19].

[19] Sukhasana.com. *"Don't Just Sit There - Sukhasana!"* Sweat Equity 2012: p.16.

Fig. 41 - *Sukhasana* Chair, Carl Brodeur.

Pack Matthews believes a yoga chair should not only to be used when practising meditation but should also work like any other chair that can be used either at home, at the office. People who spend much time sitting facing the computer all day can use the Soulseat chair. The chair doesn't have a backrest because this facilitates the flexible use of the chair and prevents it from obstructing or impeding the movement of the user body. The seat part is designed slightly higher than the platform to support the knee, thigh and leg. This is to ensure that users will always sit in the upright sitting position. This chair provides a variety of options for the user when sitting for a long time. With these adjustable positions users do not have to get up to do stretching and so on. Pack Matthews is a pianist and composer and he is also a Yoga teacher and, with the knowledge he has, he was inspired to design the *Soulseat* because he knows the benefits and advantages of cross-legged sitting position[20].

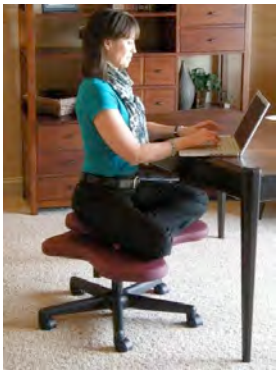

Fig. 42 – *Soulseat* by Pack Matthews allowed the user to sit cross-leg.

[20] P. Matthews. '*Soulseat*'. Web. 24 Jan. 2011

Another design that has been an inspiration for this projeck is Frank Lighart's *Obelisk*. *Obelisk* was inspired by the Menhirs in Carnac, the ancient site of monoliths located on the Atlantic coast of Brittany in France[21]. Lighart's design allows the sculptural form of the obelisk to be transformed into a suite of four chairs and a coffee table, an intriguing and stimulating visual concept suitable for limited spaces like small houses and apartments. By using the stacking concept and light materials, Lighart has solved a significant spatial problem that allows furniture that occupies a significant amount of space when in use to be stored in a visually pleasing form at other times. As will be shown, stacking bulky furniture has been one of the problems to be solved in the present research project and Lighart's is a very elegant solution.

Fig. 43 - *Obelisk* by Frank Ligthart.

Nowadays there are many other concepts that are applied in furniture design that aim to enhance the flexibility of furniture and consumer interest; concepts that help solve problems involving space and the furniture's use. One of the concepts introduced by Jair Straschnow in his designs is for an *Easychair* using the idea of transformation and sustainability as the primary motifs. The material bamboo is a readily obtained resource and in this work the chair has been designed to be folded and to transform into two different sitting positions, it can also be reversed to adjust the height of the seat.

[21] F. Ligthart. '*Obelisk*'. Retrieved from http://www.dedon.de/en/collections/detail/collection-/obelisk - 16/obelisk-142/stone-15.

Fig. 44 - *Easychair* by Jair Straschnow.

By using the concept of 'Fun, Functional and Fashionable'[22], Antonio Turco-Rivas and Joseph B. Schneider, in co-operation from the Rhode Island School of Design have produced a workstation for children, which is named *Play Table*. This workstation has multifunctions and it can provide opportunities for children to explore and to play around with the object. It is like a big block that can be arranged according to the child's imagination and it also has storage space and this workstation uses a variety of attractive colors. It was produced by using high quality materials such as steam-bent laminated maple and premium stain resistant fabrics wrapping high-density foam components that can be used for seating and as play objects. The best thing about this workstation, is that it also does not use any nails, screws or nuts for installation of each part: it has been designed so that each joint is given strength and, at the same time, it is easy to install all the parts, which rely on a series of simple shapes that can be used like dowels to connect two components together in an easily understood system of arrangement.

Fig. 45 - *P'kolino* play table, Antonio Turco-Rivas & Joseph B. Schneider.

[22] A. T. Joseph and B.Schneider. "*PlayTable*." 2005.

In 2007 Antonio Turco-Rivas designed the *Klick Desk* which is a set of furniture for children consisting of a combination of a chair and table. This design is focused on simplicity and is extremely compact and functional. The target users for this workstation are children aged from 3 to 6 years. This design considers the suitability of activities undertaken by children at this age and is based on the idea of the jigsaw puzzle for the storage project, where the two components fit together like jigsaw pieces. The system also has enough space for papers or books. A padded seat is used which is 12 inches high and there is a storage space under the seat, which makes it a versatile piece of furniture with a combination of functions. The chair can be stored in the desk and becomes a single unit and, as a result, it is able to maximize the space inside the house. The two colour decoration makes it easy to differentiate tables and chairs, and it becomes a very effective indicator[23].

Fig. 46 - The *P'kolino Klick Desk* and Chair Set by Antonio Turco-Rivas.

Another inspiration has been the work of Dr Jirawat Vongphantuset, who is a graduate of the University of Tasmania. I was intrigued by the idea of his light design, which is based on one of the posture positions used in the exercise of yoga. This light designed was named *Yogi* Lamp (2000)[24]. This lamp can be switched to different positions by a simple step, and the user can change the position of the lamp according to the requirements.

[23] A. E. Crowley. (1993). *The two-dimensional impact of color on shopping*. Marketing Letters, 4(1), 59–69.

[24] J. Vongphantuset. "*Buddhist Philosophy, Nature and Harmony: Implications for Product Design*." University of Tasmania, 2000. p-48.

These movements also function as the 'on / off' for the lights. He designed this lamp with wood as the main structure and this also gives an aesthetic value for this lamp. Led by this inspiration of Vongphantuset, the functions in this *Yogi* Light gave me the idea to design a workstation that not only serves as a chair, but is also able to change shape according to the need either of space or functionality. This is consistent with the goal, to encourage students to focus on learning. By giving them the freedom to sit in a range of positions[25] when using the furniture they will be more focused on what they do rather than being bound by one sitting position during the learning session. According to Mike Kennedy to maintain student focus on learning, the provision of a chair or table should give comfort without restricting their movements while doing their activities[26].

Fig. 47 - *Yogi* Lamp, Vongphantuset.

A final example that has been influential is a design by the Italian designer, Massimo Vignelli. It is a set of furniture consisting of chairs and tables designed in 1987 and called Dry. The inspiration to develop Dry was triggered when he was thinking in terms of the shipping factor. In designing Dry, he has created a system using only screws as fasteners and joinery is used to secure all parts and to insure strength and durability. In the multicoloured design there are no additional adhesives and colour is used effectively to make the design attractive[27]. The design inspired me to consider easy delivery[28] and assembly as a basic premise of my school furniture project, something that is not evident in most other furniture designed for cross-legged seating.

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[25] K. Lunau. "*Why Sitting Is a Dangerous Health Threat It's Tied to Obesity, Diabetes and Cancer–and Exercise Won't Make up for It.*" 2013. Web. 24 Jan. 2013.

[26] M. Kennedy. "Classroom Colors Function First Comfort and Safety." American School & University. 2005. Web. 4 Dec. 2012.

[27] M. Byars. *50 Chairs: Innovations in Design and Materials*. Switzerland: RotoVision SA, 1999. p-14.

[28] J. Fan and D. Schodek. "*Personalized Furniture Within the Condition of Mass Production.*" 2–5. Print.

Fig. 48 - Dry, Massimo Morozzi.

Introduction to School Furniture

This next section is based not only on readings that I have undertaken but also from extensive experience of the Malaysian School system. As a lecturer in the School of Art, Computing and Creative Industries at Universiti Pendidikan Sultan Idris (UPSI), I am heavily involved in the training of school teachers, since UPSI is one of the foremost higher education institutions responsible for teacher training in Malaysia. As a result of this, I am required to visit all of my students when they go off on teaching training at various stages in their undergraduate degrees. This has given me first-hand experience of classroom design and the use of space in kindergartens, and primary and secondary schools in the Malaysian education system. It is very much as a result of my observations that I began to think about the design of a new workstation that could accommodate the typical Malaysian way of sitting - that is, the cross-legged position. In this section I will discuss a series of issues regarding conventional school furniture that have given me the idea to create the new design concept for school furniture. Typically, contemporary school furniture, particularly in kindergartens and primary schools is relatively similar although it does depend upon the type of school or kindergarten and the vision of the school administrations. For a school that is able to provide classroom space according to the standards[29], there are various types of school furniture options in the market.

[29] M. L. Boyer. "Space Utilization." *School Planning & Management* (2003): 1–2.

This is clearly the case in developed countries where education is very much concerned with ensuring adequate classroom space and facilities for schools and where the organization of space will be based on the level of international standards[30]. The standard is 35 square feet per student[31]. Fig. 50 shows one example of the normal school furniture that you can see in any Western school nowadays.

The choice of using the half round table has been made because of its functions: it can be merged into a round table and at the same time it is also suitable to be placed against a wall. That said, most schools seem to prefer a round table because it is can give more space to accommodate users compared with rectangular tables that are more suitable for four users only. The selected chairs are from the type that can be stackable; it also uses a recyclable polypropylene resin for the seat and backrest. This material is used because it is fireproof and is suitable for injection molding. The bent and stamped steel tubing gives strength. Similarly tubing is used for table structures; this is combined with MDF board for the tabletop to give a flat surface for this table. Laminate is used to obtain a flat surface, and for aesthetic value and durability. The choice of materials is based on the cost of the mass production and as well the suitability for the user.

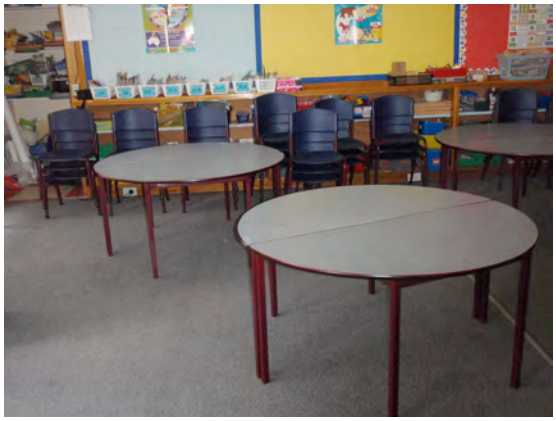

Fig. 49 - Round Table with Stacking Chair.

[30] W. Evans, A. Courtney, and K. Fok. "*The Design of School Furniture for Hong Kong School children*." June (1988): 122–134.
[31] R. White and V. Stoecklin (2003), *The Great 35 Square Foot Myth*. http://www.whitehutchinson.com/children/articles/35footmyth.shtml

In Malaysia there are several types of schools that operate according to the level of students. Government schools generally receive good support for the provision of infrastructure such as classroom furniture. For this type of school, to have new furniture facilities is relatively easy, so they often change their furniture to follow the school facilities standard.

Each classroom in primary schools has appropriate school furniture according to the age level of the students, but for secondary schools they have a same size of the furniture for every level from Form 1 to Form 6 (grades 7 – 12). Designs for the tables used for primary and secondary level are usually similar and rectangular shapes are common. This is to facilitate the arrangement of students in a row format. The underneath of tables provides a storage area for storing books and stationery. To obtain a flat surface and resistance to scratches, school furniture manufacturers use a pastel colour for laminating the table surface and chairs usually have the same colour as the table, in order to get standardization for table and chair. In Fig. 50, we can see that the height of the seat is not suited to the size of the student; there are students with legs that are hanging above the ground or sitting with only the tips of their toes touching the ground.

There is another problem with their workstation, because there is no facility for storing school bags, and so students put their bags on their backrest and use the bags as the back support while others just hanging their bags on the back of chair. The reason for putting the bags in the following positions is because is makes it easier to access books and students don’t like to put their bags on the floor because they fear dirt will stick to them. Due to weather conditions in Malaysia, which are hot and humid, most schools prefer wood furniture because it can endure the weather conditions and unlike metal furniture, it doesn’t become rusty. Fig. 50 shows a government school classroom with first year students. We can see the typical layout of the classroom.

Fig. 50 - Primary School Furniture at Malaysian Government School.

In private schools furniture selection is often not based on student size. Most of these schools have to choose their furniture from simple and cheaper materials. Fig. 51 is of a private school and the selection of steel-framed cylinder furniture and plastic is chosen for economy, because this type of furniture is cheaper than a wood-based furniture. The table frame is produced from an iron cylindrical form and coated with paint in order to avoid the occurrence of rust and for tabletop, a 'Polypropylene' plastic is being used. The height of this table is also quite high and probably inappropriate for many students. Even the chair that they are using is not specially designed for students[32] but merely a plastic chair that is available in the market and this type of chair is not as strong as wooden chair. Again the rationale for buying the chairs is based on economy[33] rather that appropriateness.

What we can see from the below image is that the colour selection is not really a choice, because this type of chair is not produced for the use of students in class activities. However it is not the only problem, when we discover that in terms of ergonomic factors the height of the chair is inappropriate and we can see that students are dangling their feet. Due to ergonomic factors, students become uncomfortable and they will often move and change positions in a number of ways including tilting the seat[34]. Tables are frequently found broken or rusty through use and misuse and this will give problems to the user in the form of rust dirt that will be attached to clothing and is not good for health.

[32] R. Lueder & V. J. Berg. *Ergonomics for Children: Designing Products and Places for Toddler to Teens*. Taylor & Francis. P.722.
[33] M. Kennedy. "Sitting Target." *American School & University*. 2004. Web. 4 Dec. 2012.
[34] P. Opsivik. *Rethinking Sitting*. London: W.W.Norton & Company, 2009. p.35.

Fig. 51 – Students in Islamic Class using a tubular table with plastic chair as class furniture.

In 2006 the Malaysian Government embarked on what is known as the PERMATA Project, which has invested hundreds of milions of ringgit in the development of pre-school and early childhood education centres including kindergartens. It has meant that there is now much systematic investment in infrastructure for a number (but by no means all) kindergartens in Malaysia. PERMATA kindergartens are supplied with the appropriate furniture for student's activities in learning and playing. For example, the *Anak Cemerlang* Kindergarten, which is located in Universiti Pendidikan Sultan Idris at Tanjong Malim, Perak, Malaysia became one of the project PERMATA kindergartens to have the facilities as mentioned. All aspects of the kindergarten's structure, from the preparation of syllabus and the development of teaching facilities including furniture were assisted. Each class has been designed to only fit a total of 20 students to ensure that each student has their own workspace, their own storage and so on. In Fig. 52, we can see how the furniture is selected. The size of furniture is ergonomic for the students and the selection of colours is also in accordance with the required standards.

Fig. 52 – *Anak Cemerlang* Kindergarten furniture.

However, not all kindergartens in Malaysia receive the same benefits as *Anak Cemerlang* Kindergarten and many private kindergartens are definitely in a different situation. Most private kindergartens have limited funds that come from non-governmental organizations and from school fees, so they have a problem with providing an adequate classroom space for the students. Most classes are conducted in a small space and all learning activities happens in that classroom, regardless of subject, whereas many government kindergartens are now able to provide different areas for different activities. For example, students at *Anak Cemerlang* Kindergarten have their work area, play space, storage and stories section.

In non-government kindergartens, with only limited space, it is difficult for a lot of activities to be done. Selection of the type of furniture is also often inappropriate. The following image, for instance shows working tables made out of cylindrical iron-framed tubing and MDF and there is graphic identification of the alphabet for the surface. This type of table is easily scratched and can become rusty especially on the leg of the table; furthermore this table is also not as strong as a wooden table. In fact, in this image, we can actually see that the table leg is already rusty, probably because of the friction between the table legs and the floor, which occurs when students want to change the position of the table. Also the image shows that students are using plastic chairs that have not been designed for use in kindergarten. This is because this chair is very light and easily moved and has been made from non-durable plastic. This type of chair is easily breakable if not used properly, especially when it is tilted on two legs.

Fig. 53 - Kindergarten student with writing activities at ABIM Kindergarten.

Fig. 54 - Kindergarten student with story activities at ABIM Kindergarten.

Most of the student activities are carried out in a sitting position on a chair but, as in the Western education system, some learning activities are carried out in other positions[35]. This can be seen in Fig. 54 where group-learning activities are carried out while the students are in a cross-legged sitting position. As noted, this activity and the sitting position are also typical in Western countries and a few kindergartens in Malaysia, yet the fact remains that in many Malaysian schools it is very difficult to provide a story section, play area or other space for student because furniture dominates the spaces. Using heavy tables makes it difficult to arrange an open space for the other activities, and for that reason all activities tend to occur in a sitting position on a chair (sitting Western style) and this situation or this sitting position also occurs in a long period and students quickly get bored and lose focus on learning[36]. Currently, there are various types of design for kindergarten chairs and tables in market, but each design is not able to solve the problems[37] with the space for a small kindergarten classroom. Although there are stacking chairs to solve space problems there remains the problem with the limited table layout and table arrangement. Furthermore, as already mentioned, using the wrong size of furniture in the classroom causes the students to lose their focus during the learning process. The chair design that is available in the market does not give freedom to the students while using it. According to Butin (2005) in order to encourage students to sit longer and focus on learning, they should be allowed to change their sitting position[38].

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[35] M. Kennedy. "*Sitting Target.*" *American School & University*. 2004. Web. 4 Dec. 2012.
[36] D. Breithecker. *Enjoying School, Fun in Learning*. Print.
[37] W. Evans, A. Courtney, and K. Fok. "*The Design of School Furniture for Hong Kong School children.*" June (1988): 122–134. Print.
[38] D. Butin. (2008) *100 Experiential Learning Activities For Social Studies, Literature, and The Arts, Grade 5 - 12*. Corwin Press. A Sage Publications

Fig. 55 - Kindergarten students sitting cross-legged during story activities at *Anak Cemerlang* Kindergarten.

Ergonomic

Children with furniture

Considering that the period that students are in the classroom is quite long, the design of furniture for the classroom will play an extremely big role in enabling students to keep focus in their learning activities. Furthermore, good design plays an important part in facilitating space in classroom, comfort, health and an ergonomic learning environment. Being too long sitting on a chair can cause students to suffer back pain, especially if they are sitting in one position in all their activities in classroom[39]. This argument is further strengthened in a chapter by Storr Hotels-Paulsen and Aagaard-Hensen in Grenville (1999)[40], which states that in Western society students aged 8 and 9 years old are expected to sit for 60 minutes out of every 90 minutes block, and this is a long period of time. Fig. 56 demonstrates one way that a Malaysian class has sought variety in its seating positions, given the limiting constraints of the classroom spatial organization. It shows students sitting in a reversed position and using the backs of chairs as arms support. It is one way to change the seating arrangement but not a particularly good one.

[39] R. Lueder & V. J. Berg. *Ergonomics for Children: Designing Products and Places for Toddler to Teens*. Taylor & Francis. Print.

[40] G. Knight and J. Noyes. "*Children's Behaviour and the Design of School Furniture.*" *Ergonomics* 42.5 (1999): 747-60. Print.

For the children this type of situation can be very stressful and there are often restraints placed upon them when they want to move. If this situation continues the child or student will start to be uncomfortable (stress), seemingly incapable (tired) and less productive[41]. In order to overcome these problems a number of steps have been taken, such as making a new school furniture design that is appropriate to the student's size because, according to Alan Hedge children should not be allowed to sit for a long time using a chair that does not fit, especially using a larger size of the chair that will leave their feet dangling[42].

Fig. 56 - Students sitting backward on chair.

In the classroom the most important piece of furniture is the student's desk[43]. The reason for this is because students will be working individually at their desks[44] for extended periods of time. At the same time students will form into a few groups, and with this in mind the student needs a drawer to put their belongings in. This needs to be easy of access; Butin has suggested that the table should be designed with storage in mind. He also believes that a classroom design should be more flexible so that it can easily adapt with new teaching strategies and that moveable furniture is just one of the factors that the classroom needs to accommodate to facilitate these changes[45].

[41] D. Breithecker. "*Beware the Sitting Trap in Learning and Schooling.*" Design Share: Designing for the Future of Learning (2009): 9-13 pp. 13.11.2009.
[42] A. Hedge. *Ergonomic Evaluation of the Kinderzeat Child Seat in a Preschool Sitting*: Cornell Univesity, 2002.
[43] D. Butin. "Classrooms." National Clearinghouse for Educational Facilities. Washington, 2000.
[44] G. M. Eadie. "*The Impact of ICT on Schools: Classroom Design and Curriculum Delivery*." February (2001).
[45] D. Butin. "Classrooms." National Clearinghouse for Educational Facilities (2000). Print.

Nowadays most classrooms are occupied fully by the chairs and tables, and all the activities in classroom will involve using a table and chair[46] for example, for writing activity and drawing. Even the carpeted open corner usually provides a chair for children to sit on to listen to story telling and for reading as well. This might be the reason children's' behaviour has been influenced by the layout of furniture in the classroom. One function of school furniture is also to ensure that the student will not move around and will stay in one place[47], and this will give advantage to the teacher to monitor the student and their behaviour[48]. Fig. 56 clearly shows a typical layout of furniture seen in schools as well as student activities. Here we can see some differences in style of seating amongst students. They are using the furniture flexibly rather than with a strict adherence to the preferred ergonomic position[49]. For instance, one child is seen kneeling on the chair (Fig. 57). In this example the 'Western-style seating is hardly comfortable because of the narrow platform but is clearly preferred for carrying out some learning tasks by some children. It also shows that the backrest is not necessarily practical among students. Mandel[50] doesn't believe that backrest has been created to encourage students to sit in an upright position, but it is more influenced by the Staffel design in 1884. For him this concept, sitting in a straight 90 º is totally wrong[51].

Fig. 57 - Students employing various sitting positions with Western-style seating.

[46] A. Woodcock. "*Ergonomics, Education and Children: a Personal View*." Ergonomics 50.10 (2007): 1547–60. Web. 21 Nov. 2012.
[47] J. F. M. Molenbroek, Y. M. T. Kroon-Ramaekers, and C. J. Snijders. "*Revision of the Design of a Standard for the Dimensions of School Furniture*." Ergonomics 46.7 (2003): 681–94. Web. 14 Feb. 2013.
[48] M. K. Clayton, and M. B. Forton. "*Make the Classroom Fit the Children ' s Bodies*." .
[49] D. MacVicar. "Are You Sitting Comfortably?" The British journal of radiology July 2005 : 581.
[50] A. C. Mandal. "The Seated Man." *Homo Sedens* 1985. Print.
[51] J. Tiedeman. "New Concepts in Seating." 1–6. Print.

School Furniture Standard

According to the British / European Standard (BS EN 1729) there is a range of standard furniture dimensions and sizes depending on the category or level of schooling for students. The standards are designed to suit the age and height factors[52]. Much of Europe and Asia use these standards as a benchmark measure[53] for selecting school furniture. There are six levels or six different sizes starting from the age of three years to the age of eighteen years. The following diagram (Fig. 58 and Fig. 59) shows the comparison carried for the six ratios of seat height to floor level. For Level 1 students aged from three years old to four years old, they should use the average size of 250 mm height, while for kindergarten students aged from four to six years old they need to follow the Level 2 standard where the seating height is 310mm. According to the British Standard students aged between six and eight years old are encouraged to use the height dimension size of chair in Level 3 with the average height of 350mm; Level 4 covers the years eight to eleven years old and the average height is 380mm. Similarly at the Level 5 the British Standard is recommended for students aged eleven to fourteen years old where the average height goes up to 430mm. Here the height difference has increased significantly by 50mm. Lastly, for the Level 6 representing the ages between fourteen years old and eighteen years old, the average height for the seat is 460mm high and the age range of the students that use this level is greater than the other level.

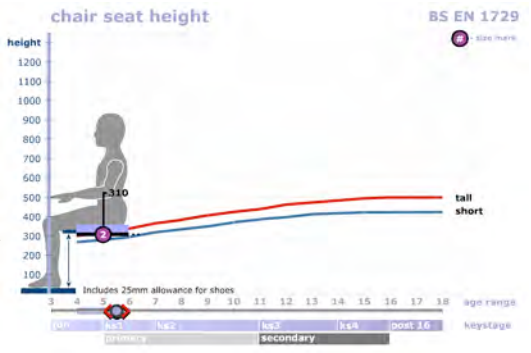

Fig. 58 - British Standard Chair Height for student age 4-6 years old.

[52] Furniture Standards. "*British / European Standards*." 2011. Web. 31 May 2012

[53] J. F. M. Molenbroek, Y. M. T. Kroon-Ramaekers, and C. J. Snijders. "*Revision of the Design of a Standard for the Dimensions of School Furniture*." Ergonomics 46.7 (2003): 681–94. Web. 14 Feb. 2013.

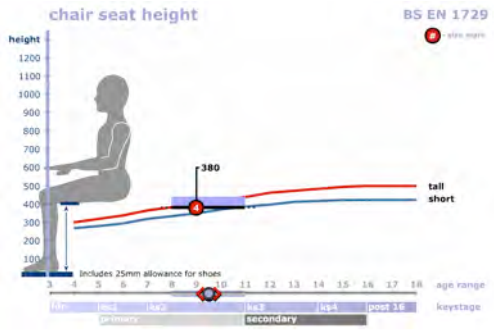

Fig. 59 - British Standard Chair Height for student age 8-11 years old.

The following diagrams in Fig. 60 and Fig. 61 demonstrate the ergonomic relationship between students and table height according to British Standard measurement (BS EN 1729). For the standard measurements for a student table, there are six standards in the British Standard to which manufacturers of school furniture should comply. An average height of a table for students aged from three years old to four years old, BS has determined, is 460 mm. For students aged from four years old to six years old, the average height of a table is 530 mm – a 70 mm difference in height between Standard 1 and Standard 2. While for Standard 3, the average height of the table is as high as 590 mm and is suitable for students aged from six years old until eight years old. For students aged from eight years old to eleven years old the height specified for Standard 4 is an average table height of 640 mm.

Again, there is a significant 50 mm difference between Standard 3 and Standard 4. Standard 5 is suitable for students aged eleven to fourteen years with an average height of table of 710 mm - much 70 mm of height difference between it and the Standard 4. Meanwhile, the average table height for Standard 6, which will be used by students aged between fourteen years old to eighteen years old, is as high as 760mm and the comparison between the Standard 6 and Standard 5 is only 50mm.

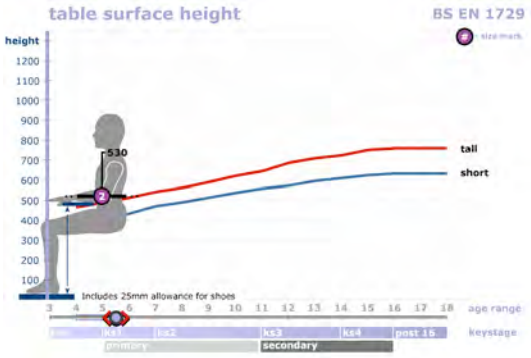

Fig. 60 - British Standard Table surface height for student age 4-6 years old.

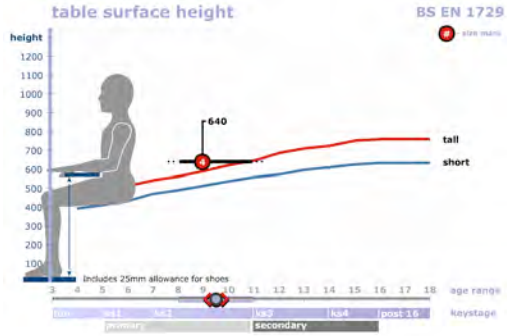

Fig. 61 - British Standard Table surface height for student age 8-11 years old.

Conclusion

Based on the information obtained from SIRIM Berhad formerly known as the Standards and Industrial Research Institute of Malaysia (SIRIM), as Malaysia does not have a comprehensive study on standards for school furniture most furniture operators use the British Standard and it is also certified by SIRIM as the correct standard[54]. Because my design is for sitting in the cross-legged position, chair height and table heights are different from the measurements given in the British Standard. This is because when sitting in the cross-legged position students' feet will not be on the floor as described in the British Standard. Measurements of space between the tables and seats in this design is in accordance with British standard, where spatial distance is also suitable for users to move their legs while sitting in cross-legged or maybe switching to another sitting position.

[54] SIRIM Berhad. *Draft Malaysia Standard (03f010r0)*. Selangor, Malaysia: SIRIM Berhad, 2004. Print.

For the kindergarten furniture design the size of the spatial distance in this design follows standard level 2 of 220 mm, suitable for children from four to six years old. While for the primary furniture design, the suitable standard will be at level 4 with the Students aged from eight years old to eleven years old and the spatial distance will be 260 mm. Using these references to the British Standard, means that any design devised for the Malaysian system will be compatible with design requirements in other countries as well.

	Table Height	Chair Height	Table height (T) - Chair height (C)	Space Between
Level 2	530mm	310mm	530 - 310	220mm
Level 4	640mm	380mm	640 - 380	260mm

Fig. 62 – Table for space between Table height and Chair height from British Standard.

CHAPTER 3: THE STUDIO INVESTIGATION

Bersila: The Workstation

Bersila term, which means cross-legged in Malay was described in detail in chapter 1. This term has been selected because it is very suitable to be used as the name for the workstation, which is designed to allow students to sit cross-legged in class.

Design for the *Bersila* Workstation: Kindergarten

My first year of PhD Studies was taken up experimenting with design and with ergonomics, focusing on things such as storage solutions, appropriate sizes and materials and thinking about new ways in which a student might sit on the chair or how this design will be used as a child's work station.

Phase 1: Reference

In the first phase of my design process, I listed all the criteria that should be in my design. During this stage, I was focusing on easy storage and a size that is suitable for children to sit cross-legged. The workstation also needed to be portable, ergonomic and safe. I made a large number of sketches to establish the concepts at this stage. At the beginning of my idea, I was influenced by designs made by Karim Rashid and Gianni Pareschi.

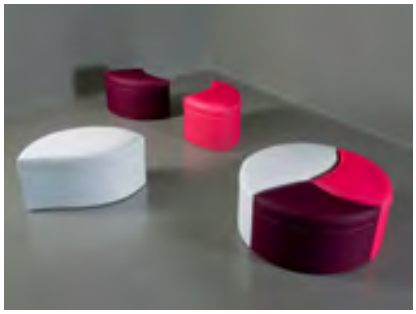

Fig. 63 – *Seater* for Valdichienti by Karim Rashid.

Fig.64 - *Fiocco* by Gianni. Pareschi

Phase 2: Design

In the second phase, I focused on a new design concept and began to look at the form and at ways in which it might fold. I also began to investigate storage solutions with the idea that the workstation would be portable and that the kindergarten children would be able to take their possessions easily from one classroom configuration to another. During the concept development, I started with mock-ups and began thinking about new solutions derived from the pattern making and arabesques of Islamic interior design and architecture that might be included in the overall design.

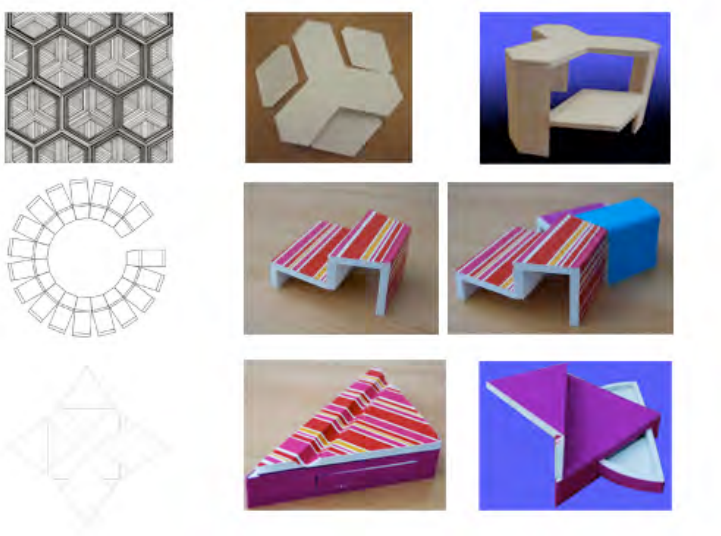

Fig. 65 - Mock-up in designs:

1. I am using a pattern formed from a hexagon.
2. Can be a round arrangement.
3. It can be arrange to a star composition.

Phase 3: Identified the Idea and Proportion

I then developed Prototypes 1 (Fig. 66) and 2 (Fig. 67) in the third phase to establish the right proportions and ergonomic viability of the design. Some observation and experiments were done to determine the suitability of the function. However, the result was disappointing, as there were some weaknesses in both Prototypes 1 and 2. It seemed that the weakness related primarily to strength, for example in Prototype 2, the holder at desk panel is not strong enough to hold the panel (Fig. 67) and in Prototype 1, the weakness is in the seating area where the weight of the sitter may cause the join to break (Fig. 66).

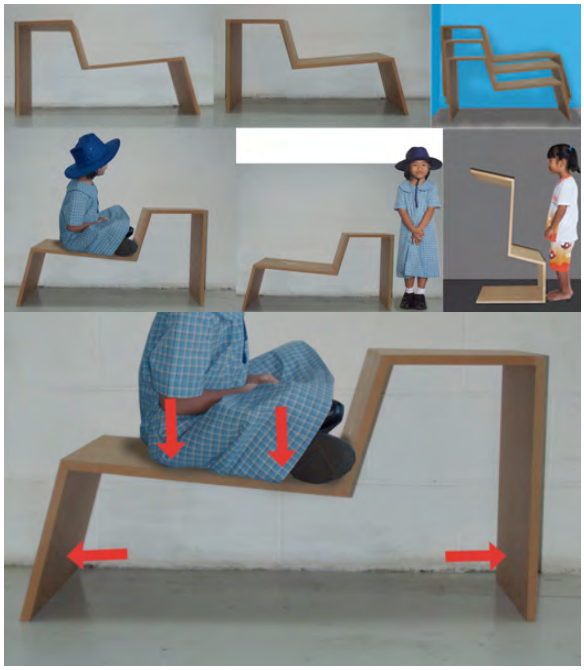

Fig. 66 – Proportion between student and arrow shows the weakness in Prototype 1.

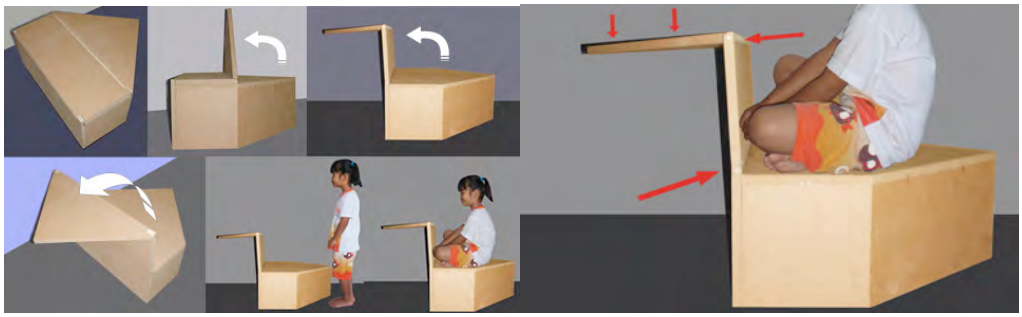

Fig. 67 - Proportion between students, how the Prototype 2 work and the weakness at writing panel.

Phase 4: Redesign The Idea

In the fourth phase of the design process, sketches and mock-ups were developed once again to improve the design. After completing an assessment of Prototypes 1 and 2, some elements and other functions were identified. As I continued developing the concept, I became fascinated with the work of Dr Jirawat Vongphantuset, and I was interested in the way that he designed the *Yogi Lamp* (Fig. 47), which is mainly inspired by the movement of the human body. With this in mind, I began producing a few concept ideas by using his example. For instance, in Mock-up 4.1, I used the concept of LEGO toys to develop this

idea and I also worked on other concepts and functions for Mock-up 4.2 that drew upon the developments of Prototype 2.

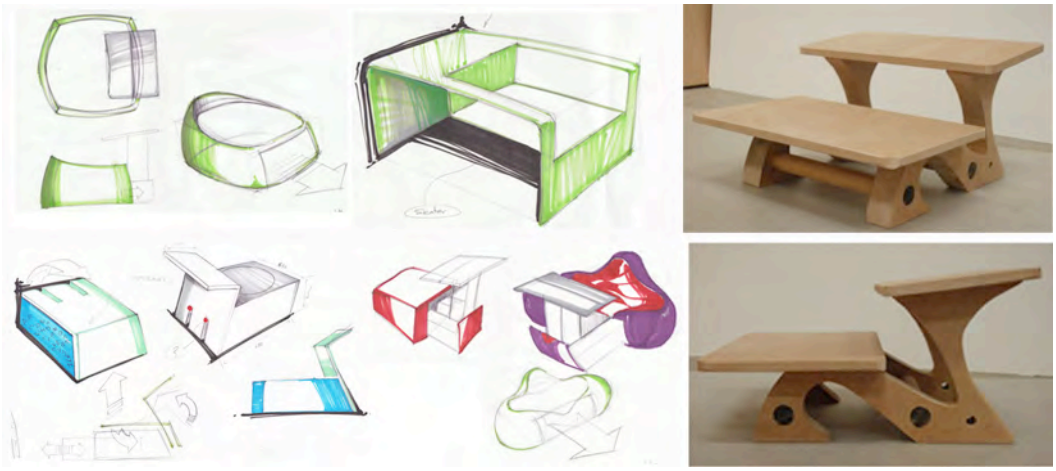

Fig. 68 - Design Development (Sketch and Mock-up 4.1).

As a result I decided to choose Mock-up 4.2 (Fig. 69) as my next design concept to be developed, because the function and criteria appeared more suited to this design. The positive aspects in this concept are that it has the storage compartment; a big space for the *bersila* position and it also has a folding writing surface panel. In addition, then my criteria were directed towards manufacturing processes and mass production. Here, I referred to a work of Massimo Morozzi with his chair design called *Dry*[55] and his work is based upon a design criterion directed at mass production. Mass production is a central feature of my own concept, since the aim is to create a workstation that can be produced in large numbers for classrooms in South East Asia. Then from this idea came experiments with different solutions to the size of the hinging in each of the Mock-ups 4.2.1, 4.2.2, 4.2.3 and 4.2.4 to find the optimal mechanism for folding the workstation (Fig. 70).

[55] M. Byars. *50 Chairs: Innovations in Design and Materials*. Switzerland: RotoVision SA, 1999.

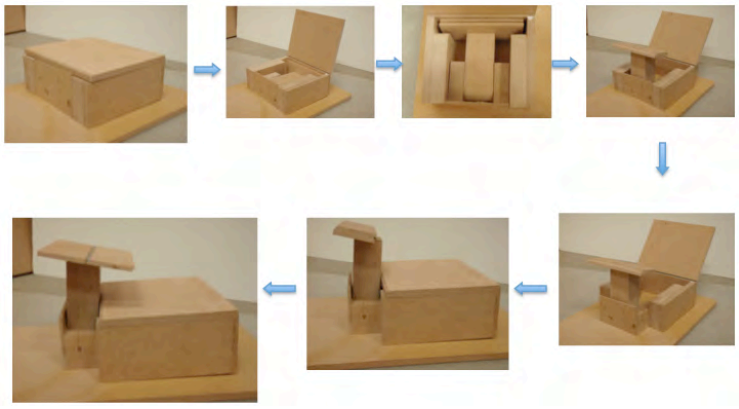

Fig. 69 – How Mock-up 4.2 work.

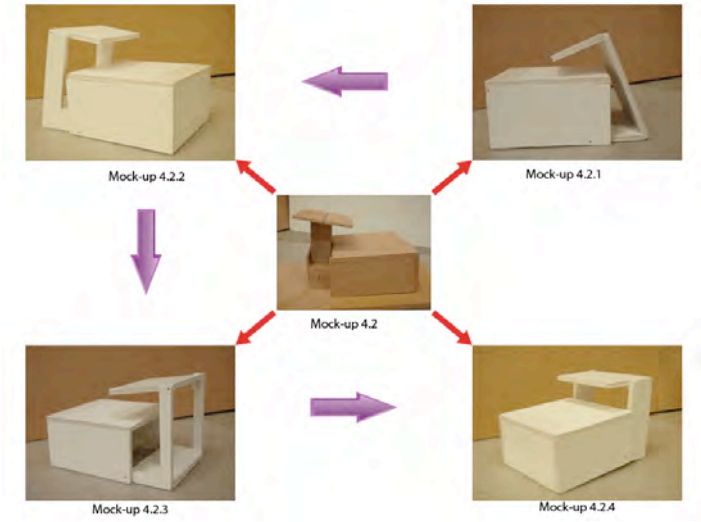

Fig. 70 - Mock-up 4.2 Experiments with Difference Hinging.

Phase 5: Prototype and Design Development

In the next phase, I began developing the new Prototype 3 by following the design from Mock-up 4.2.2. The concept driving this design was to find the best way for the writing panel surface to fold inside the box when not in use and when in use, to insure its flexibility, strength and safety; I also began work on introducing a castor to make it easy to be moved for storage. Unfortunately, the way this design works makes it really complicated when we try to fold the writing surface panel into the box. There were 6 steps (Fig. 71) to fold the writing surface panel into the box or to pull it out from the box – an obviously unsatisfactory solution for kindergarten furniture.

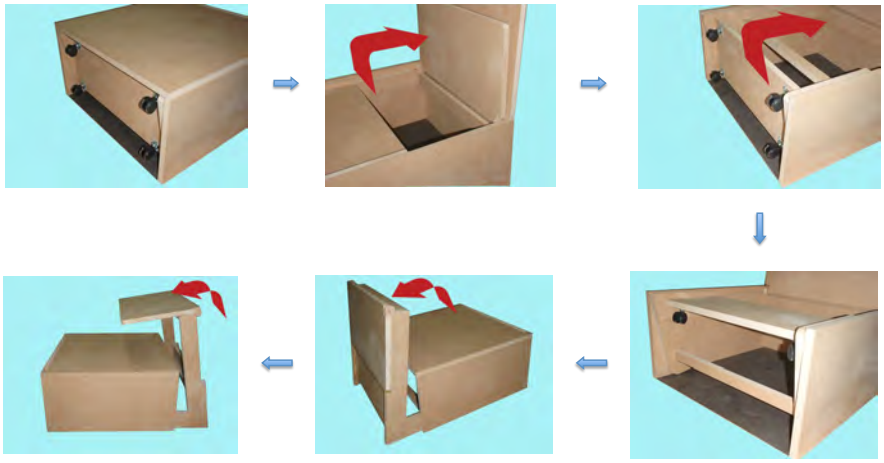

Fig. 71 – How to use the Prototype 3.

As a result I began developing the next design by creating a new Prototype. Some changes were made in the new Prototype 4 and I removed the writing panel from inside to outside of the box. The result was a success and it became easier to fold in or to pull out the writing surface panel. In the Prototype 4, I also moved the castor position at the bottom of the object but that became a new problem in this design, because the Prototype would shake when the children sit on it.

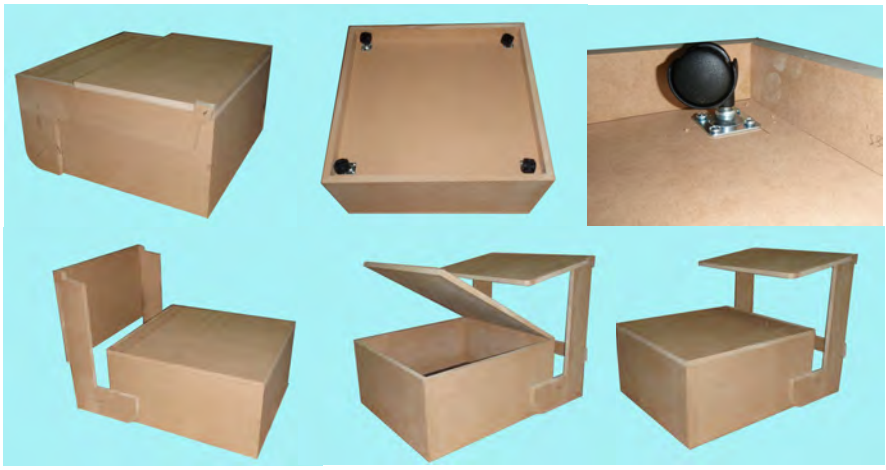

Fig. 72 - Prototype 4, detailing.

To attempt to overcome the problems in Prototypes 3 and 4, I have given some consideration to using other material than the 'MDF' with which I was experimenting in the first Prototype. *Gaboon* turned out to be the best solution at

this stage. I selected a 15mm *gaboon* as my core material to create the next Prototype. I created a new design (Prototypes 5 and 6) with this material to see how it works and in order to reduce the size of the object. As a result of developing this Prototype, I found that it was much better to use *gaboon* as the core material. Children find it more comfortable to handle Prototypes 5 and 6 compared to Prototypes 3 and 4 because they can easily lift and move the furniture, and pull out the desk panel to install as their workstation.

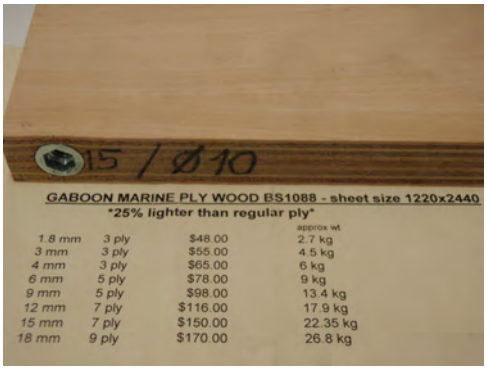

Fig. 73 - *Gaboon* Marine Plywood (15mm, 7 ply, size 1220x2440).

Fig. 74 - Prototypes 5 and 6, detailing.

In comparison with other Prototypes, Prototypes 5 and 6 use a drawer for the storage compartment. In this design, the user can choose either the *bersila* sitting position or a Western sitting position so there is flexibility in using this

furniture[56]. Only two castors have been used for this Prototype and even so it is still easy to move. There were some problems with the desk panel holder and desk panel in the previous Prototypes (3 and 4) because it was too dangerous when the children tried to install and reinstall the panel.

I still hadn't been able to resolve the issue of children possibly catching their fingers between holder and panel but in this design I decided to create a space between the desk panel holder and the desk panel in order to lessen the possibility that children will inadvertently catch their fingers. With this solution children can safely pull the desk panel in or out by using that area created by the gap as a handle. The solution is illustrated in Fig. 75.

Phase 6: Design and Production Process

After doing some experiments and following extensive discussions, I defined and then began to work on the continuing problem of the strength aspect of the hinging in the writing panel holder for Prototypes 5 and 6. I was very satisfied with the design of Prototypes 5 and 6. The early mock-ups and Prototype were cut manually but by the time I commenced Prototypes 5 and 6, I was able to make use of a MULTICAM CNC routing machine: I designed the specifications so as to allow all of the components of the workstation to be cut from a single sheet of plywood and it immediately meant that I was able to produce the Prototype more quickly and economically and of course, this focused attention on the Prototype's potential for mass production and 'flat-packing' for transport.

[56] R. Lueder & V. J. Berg. *Ergonomics for Children: Designing Products and Places for Toddler to Teens*. Taylor & Francis. p.725

Fig. 75 – Ergonomic hander for Prototypes 5 and 6.

At this point I decided to create a Prototype 7 for exhibition so that I could get responses from other people about this concept. After discussion I decided to put a varnish on Prototype 7 to emphasise the original effect of *gaboon*. This Prototype was exhibited at the Plimsoll Gallery, Hobart late in 2010 in 'Seeing Double' and subsequently in Malaysia when the exhibition toured to Perak in March 2011. I received a really good response from audiences regarding my concept both in Hobart and in Perak.

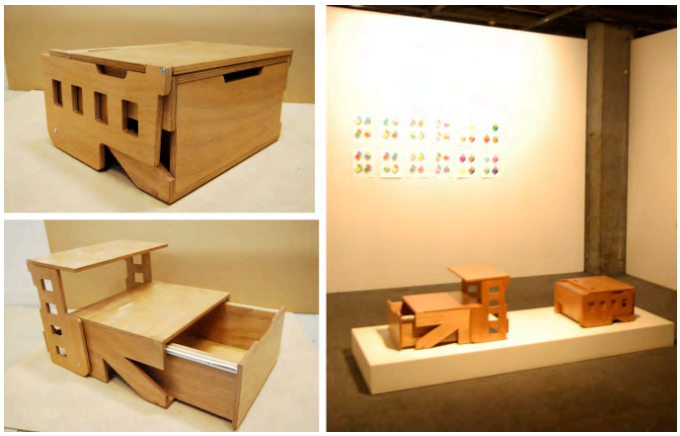

Fig. 76 - 'Seeing Double' Exhibition at Hobart 2010.

Phase 7: Prototype testing

During my second year I have produced Prototype 8 with one set of four units in different colours that might be suitable for the children[57]. Here I selected red, green, yellow and blue. To further my research studies, I needed to obtain

[57] K. Engelbrecht. "*The Impact of Color on Learning*." National Clearinghouse for Educational Facilities. 2003.

feedback in order to ascertain the weaknesses in the latest Prototype that had been developed. I was thinking of getting the responses from my potential target users so at this point I decided to carry out observations in a selected kindergarten in Malaysia. I prepared 4 workstations and 20 kindergarten students took turns using the Prototype in the kindergarten class over a period of 3 days.

Considering the test was to be conducted in Malaysia, I had to pay attention how to transport the Prototype out of the location in which it was produced. Among the factors to be considered were packaging and how to transport four Prototypes easily. In order to lighten and simplify the transport process I had to consider reducing the use of materials, and so in the next design the storage compartment has been replaced with a plastic storage tub. The advantages of using plastic storage tubs, is that each Prototype unit became lighter as there is no more *gaboon* storage compartment as had been the case in Prototype 7.

Other advantages of the plastic storage tub include its strength, its lightweight, its variety of colour, and its easy availability. For testing purposes, I did not need to transport a plastic storage tub with me to Malaysia, because this kind of storage tub is also easily available in Malaysia. I used a packing box measuring 550mm x 550mm x 320mm for packing 4 units of my Prototype. With that size, the process to transport the Prototype to Malaysia became much easier. Indirectly the issue about transportation for marketing has been answered with this idea.

Fig. 77 – Packaging Box for four units of *Bersila: Kindergarten workstation.*

Fig. 78 – After cutting by MULTICAM CNC.

When I introduced this workstation to kindergarten students in Malaysia, I found that students were very cooperative with this process. On the first day I was only involved as an observer during the day's learning activities. This enabled me to identify the kinds of learning situations and activities that occur throughout in the classroom. I was also able to observe the ways in which students were using existing furniture.

By the end of the observation day it was obvious that the students need extensive classroom space and a set of furniture that can give them a freedom when using it. I found that students were not sitting in one position, especially when writing and drawing. Furthermore, when the teacher is giving a briefing or explanation, the students appear restless and constantly change their position. Some tipped their chairs backwards or forwards, some laid their heads on the table[58], while others were sitting cross-legged on their seats. It demonstrated that the students would be constantly shifting their position on the available furniture[59].

[58] P. Opsivik. *Rethinking Sitting*. London: W.W.Norton & Company, 2009. p.13.
[59] D. Breithecker. *Enjoying School*, Fun in Learning.

Fig. 79 - Prototype 8 in Kindergarten classroom at Tanjong Malim Perak, Malaysia.

On the second day I placed four (red, green, blue and yellow) of the *bersila* Prototype in the class for the test. To begin this testing session, I asked the class teacher to select four students - two boys and two girls - to use the Prototype. At the beginning the students were rather awkward, but after guidance given by the teacher on how to convert this Prototype from a box into a workstation, then they were able to do it by themselves. Writing and colouring activities were carried out during the test session, and I could see that the students were comfortable using the Prototype.

They can sit cross-legged and can change their position without significantly affecting their focus on what they were doing. Upon completion of learning activities, they were required to fold the Prototype to the original shape to give way to the next activity; I could see they were able to do it by themselves without assistance from teachers. They also arrange the Prototype in a perfect position against the wall without direction from the teacher. This was unexpected and it was a very interesting and good response. The next activity involved play, and this activity is very popular among kindergarten students, so I understood why the teacher had asked the students to move aside the Prototype.

While playing they asked permission to use the Prototype to play with and as a result I realised that the students were creating several new functions that I had not anticipated[60]. They used it as an armchair where the Prototype was upended and the student sat on the storage box while the seat compartment was the backrest. They also imagined this Prototype as a push car and train, and also a place for them to gather[61]. Indeed, they reflected Marco Zanuso observation that children will use their fantasy and make the objects become something else[62].

Fig. 80 - Kindergarten Children using Prototype 8 during testing in Malaysia.

On third day of testing, I wanted to see the student react to the Prototype in terms of colour. At this time I have combined the two colours into a Prototype, the yellow colour of the desk and combination with green colour on the seat, green colour on the desk combined with blue, red on the desk combined with yellow, and finally a blue colour on the desk combined with red colour on the seat. I found that students were more interested in these combinations of colours[63]. In this session, the teacher selected her students and let them use the Prototype itself, starting from the arrangement to the process of changing its shape to the workstation.

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[60] K. Hunter. "*Environmental Psychology in Classroom Design*." 2005.
[61] M. K. Topping. "*Revealing The Relationship Between Furniture And Play: An Informative Tool For Designers*." 2008. p.58.
[62] The Dunhill Industrial Design Lecturers. *Marco Zanuso Australia Lectures*. Melbourne: Trevor Wilson, 1971. p.33.
[63] S. Wagner. "*Classroom Colors Make a Difference*." All Classroom Design Articles. Web. <http://www.hertzfurniture.com/buying-guide/classroom-design/classroom-colors.html>

I found that students were able to easily understand how to operate the Prototype. Before I ran this test, there were some parts of the Prototype which worried me, especially the connection between the desk panel and the desk panel holder. There was a chance of the students possibly catching their fingers in between, however when the test was carried out, my concerns were allayed since all of the children operated the mechanism with confidence. This indicated that the part was not dangerous as I thought. However I have detected some problems that exist in this design. The main problem is the castor position located inside the object's structure. It becomes unbalanced because there is only one pin to hold the castor from becoming detached and these pins might contribute to consumer safety and it also easily causes the castor to be scratched. The conclusion from the observations I made showed that the Prototype was working well and was easily used by students. The research testing also showed children were comfortable sitting cross-legged on the *bersila* while working with their activities. I received excellent immediate feedback from the teachers who enabled the observations both in Australia and in Malaysia. The documentation of the student interaction with the *bersila* workstation was recorded and from this documentation I was able to show that when the students began working with the Prototype they explored other possible functions [64] for it - it became a toy, a dais, and even another type of stool or chair when set on its edge.

Phase 8: Redesign the Problem

In next stage, as a result from my Prototype testing, I developed a new workstation to tackle the problems that I had found when the students were using the earlier Prototypes. During testing in the kindergarten, I could see that the arrangement of the classroom's usual tables encouraged only one simple formation for seating and that gave me the inspiration to explore different seating arrangements with my Prototype. As a result, I produced an accessory that serves as a connector and it also has a space to put stationery.

[64] J. Lewman. *One Hundred Toy makers Who Create Wood Toys for Fun and Profit*. Vol. 1: Toymaker Press, 2010.

However most importantly, these connectors are able to function to give a variety of different layouts to this Prototype. By using this connector the workstations can be grouped in circles, ovals and an L-shape. In order to attach the connector, I have created a kind of latch to lock the desk panel and connector. After I had produced the connection Prototype, my own child was asked to try using that connector, and it proved hard for her to use it. A number of constraints were identified including the difficulty of attachment and its extra weight.

Fig. 81 - 'Connector' also can be as stationery holder.

Fig. 82 - The images show how to connect the Prototype by using the 'Connector'.

Next I produced Prototype 9 to solve the problems existing in Prototype 8 that I had identified during the tests and also to solve the problem on the connector design. In Prototype 9, I changed the pattern of the desk panel holder and the seat structure and using an organic pattern, I have introduced cut-out sections that function easily as handles that can be used to open and close the workstation and to move it around.

I have also changed the castor position from inside the workstation to between the seat structure and desk panel holder. The used of a ‘connector screw and sleeve’ as a castor holder is a good decision because it is not only strong but also provides aesthetic value. In this Prototype I have create a Connector Panel inside the Desk Panel and it can be slid in or out when students need to use it. I also designed a backrest in Prototype 9 as an additional accessory. It is easy to install on the workstation and it can also be stored in the storage box when not in use.

Fig. 83 – Student with Prototype 9.

After producing two Prototypes 9, I gave my children the opportunity to use the Prototype, so that I could identify if there were still any problems with the design. As a result, I was able to identify several issues: the children had difficulty with operating the connector panel and the latch and lock system; and a footrest panel and the desk panel holder (Fig. 84) were found not to be stable and the table structure still seemed rather flimsy and easily shaken.

Fig. 84 – Footrest panel.

After a discussing this set of issues with my supervisors, I decided not to produce the connector panel or the backrest. I was aided in the latter decision by Mandel's point of view. He argues the backrest support is not a requirement for this kind of seating[65]. Although the connector panel allows the workstations to be grouped in several formations, it diminishes the flexibility of the workstation and of course, the workstations are much more easily arranged if there is no fixed way in which the joining of the workstations is carried out. Once I had decided this, I produced two Prototypes 10 using two different colours on each Prototype. I chose a light grey colour and a green on Prototype 10.1, and in Prototype 10.2 I used blue and green. The selection of two colours on this Prototype was influenced by observations carried out in kindergarten, where students are more interested in using a Prototype that has two colours than one[66]. It also serves as an indicator for the workstation function. I enlarged the footrest panel and it gives more strength to hold the desk panel holder structures; there is also space for students to put their feet when in a European style sitting position. I have also added another panel at the bottom of desk holder structure so that this part does not shake even when a student is standing on it. I also used larger hinges to give more strength to hold the desk panel. A ball catch has been introduced on the desk panel and desk panel holder structure to ensure that the structure and desk panels are not easily opened, and this has indirectly become a lock to that part. The connectivity on every part has been replaced by using the connector bolt; it will hide the fastener screw.

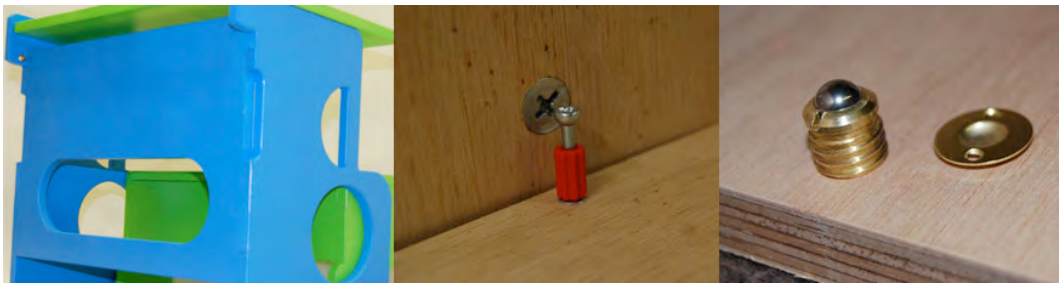

Fig. 85 – Footrest panel, Connector Bolt and Ball Catch.

[65] A.C.Mandel. "*Balanced Sitting Posture on Forward Sloping Seat*". http://www.acmandal.com.
[66] K. Engelbrecht. "*The Impact of Color on Learning*." National Clearinghouse for Educational Facilities. 2003.

After I completed Prototype 10, I had extended discussions with my supervisors and it was concluded that this Prototype was getting very close to the fully resolved workstation although some changes needed to be made to the handle at the desk panel structure. With this in my mind I have produced Prototype 11, and I redesigned the handle location in this design. As will be shown in the next section, there is a strong similarity between this handle and that developed for the primary school workstation design. Prototype 11 seems to solve the problems existing in the previous design and represents the final Prototype for my cross-legged sitting position furniture concept for kindergarten children.

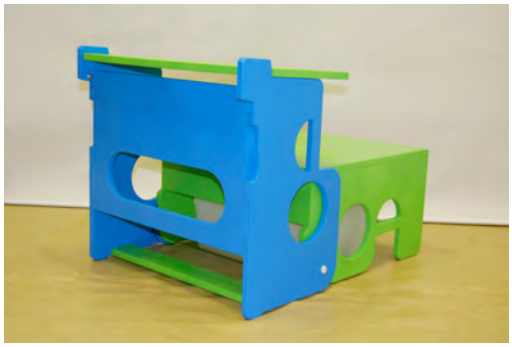

Fig. 86 – Prototype 10, Design for kindergarten furniture.

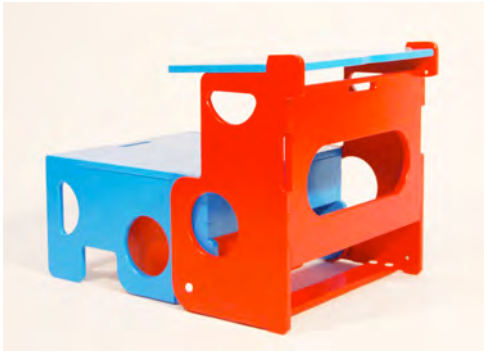

Fig. 87 – Handle at Prototype 11 give an extra function to this design.

Design for the Bersila Workstation: Primary

The research studies in Malaysia led me to start to develop a new range of furniture objects that would be different but would extend my work to the next level of primary education – again with the same concept of the cross-legged sitting position. This is because I wanted to explore the possibility that suitable inexpensive and flexible furniture incorporating the *Bersila* concept can be applied at all levels in the Malaysia education system.

Phase 1: Sketches

At this stage sketches were made to establish a suitable design for this early level of primary school education. Four ideas with desired characteristics were put forward for consideration. In the first idea, I used the concept of a slip-on for the armrest. The armrest can be adjusted to support the legs when sitting cross-legged. In the second idea, I worked with the form of a triangle to used as the basic shape and thought about a flip-up for the writing panel. In the third idea I created a support for the thigh when sitting cross-legged and this support can be adjusted to give comfort to the user. Finally for the fourth idea, I applied the shape of a kangaroo to the design. Among its functions I was contemplating were the provision of an adjustable seat height, a flexible backrest and also that the design would have adjustable leg support when sitting cross-legged.

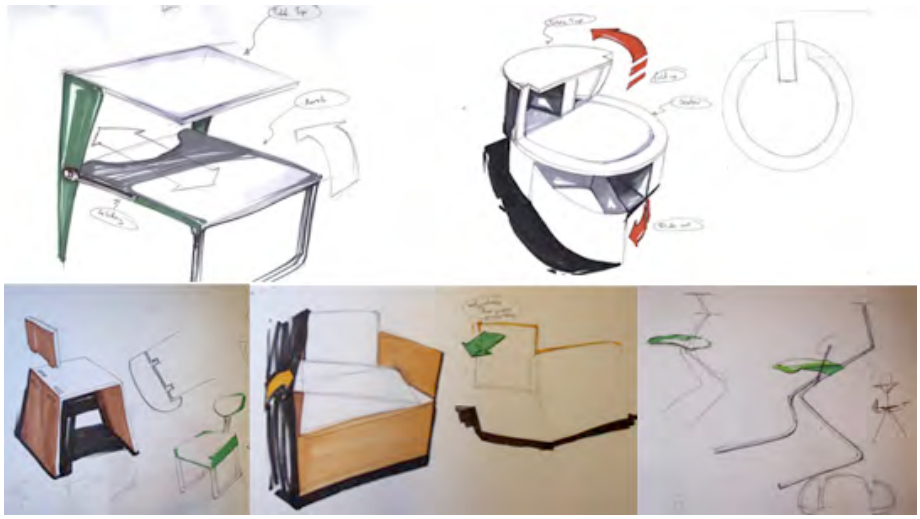

Fig. 88 - Sketches a Design for Primary Level Workstation.

Phase 2: Technical drawing

In this phase, I transferred my ideas from sketches to technical drawings so that I could see more detail in the drawing in my design. I used 1:5 scale for these drawings. Through these technical drawing, I was able to estimate the real size, proportion and ergonomic qualities and was also able to detect whether there were any significant problems with the design.

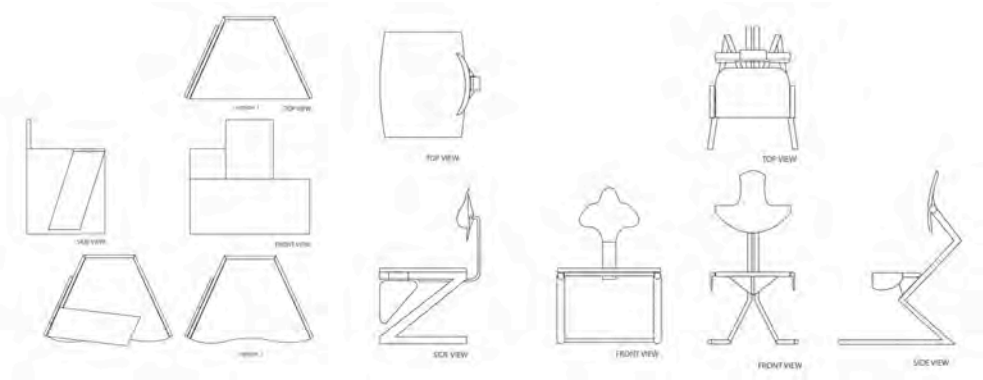

Fig. 89 - Detail Drawing.

Phase 3: Mock-up Development

In the next phase, I developed a mock-up and three ideas from the sketches were selected so that I could see the designs from a 360º view in order to establish whether they would be functional. During the development of the third mock-up from the previous sketch, I got an idea to create a new mock-up with a different solution. In this idea I created an accessory for existing chairs with a view to enabling the sitter to attach the 'wings' to the chair when he or she wanted to sit in the cross-leg position. I thought it would support the thighs and would be very easy to install or to remove when necessary. After discussion and some further research, however I found this idea was not suitable it had the potential to be easily broken and it appeared to be completely different from the kindergarten furniture design. Then a new design was developed to maintain the characteristics that were in my kindergarten furniture design, the combination of tables and chairs was retained from the kindergarten Prototype. I developed a scale mock-up with the basic design from the characteristic of the kindergarten furniture although in this case the focus is on children from ages 8 to 11.

Fig. 90 - Mock-up for Designs 1.1, 1.2, 1.3, 1.4, 2, 3 and 4 (Chair Accessories). The first row shows the adjustable thigh rests; the second row shows the flip-up desk and seating platform suitable for cross-legged sitting platform with adjustable thigh supports and the 'Kangaroo' design.

Fig. 91 - Mock-up for Design 5.

Phase 4: Design development

After identifying the functions that might be suitable to put into this design, I began sketches for the new design by considering the ergonomic, safety and user-friendly aspects of the workstation. I created two designs utilizing the following criteria; stability, simplicity of form and ease of use. The other criteria that I established for this design were a large seating area for sitting cross-legged, multi-functionality, its ergonomic qualities, ease of installation, its comfort and lightness.

Fig. 92 - Design Development for
Primary Level, design 5.1 and 5.2.

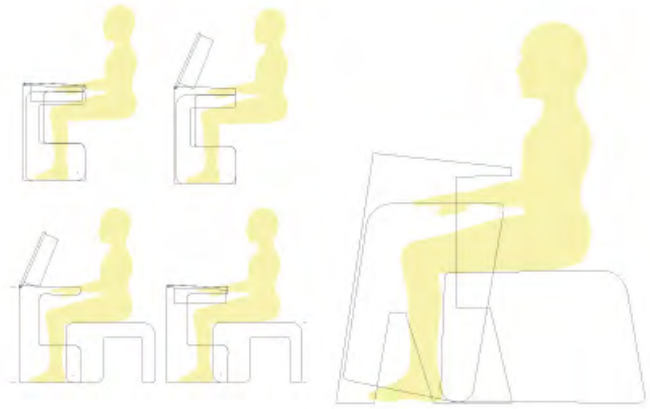

Fig. 93 - Sketch for considering issues in
Ergonomics and Proportion.

Phase 5: Prototype development

I then began developing two Prototypes with different shapes but incorporating the same functions. The material selected was 15 mm *gaboon* marine plywood. In this design, the Prototype prioritizes stability, simplicity and ease of use. It was also essential that it was an ergonomic design. To provide stability, I used the pyramid shape because it has a broad form below. In the seating area, I created a space for the user to pull out the seat when the user wants to use it, and there was a cushion to give comfort when sitting cross-legged.

The second Prototype was a simpler design, but it has the same functionality. In this design, I have added an easily installed backrest as an accessory (Fig. 95). After both Prototypes had been developed, I observed the way in which my young children used both, as well as having lengthy discussions with my supervisors. A number of problems emerged including the desk panel holder, the design of which made it difficult for users to move their legs in or move out when sitting in the cross-legged position. One of the multi-functional ideas I had been working on had been the creation of an 'easel' position for the desktop to facilitate drawing in order to enhance the workstation's flexibility. But, as can be seen in Fig. 94, the design involves a significant incline that is far from comfortable to use.

Fig. 94 - Design 5.2 for Prototype 1; the seat can fold-in and the top flips up as an 'easel' for drawing activities.

Fig. 95 - Design 5.3 Prototype 2 with a backrest created as an accessory.

Phase 6: Prototype Redesign

In Phase 6, I redesigned Prototypes 1 and 2. Strength was increased for the drawing panel through the inclusion of a stopper for support and I also created a stationery space for the panel. I developed a 'Yin and Yang' pattern for Prototype 3 (Fig. 96) and most of the shape in this design including the seat and writing panel is drawn from organic shapes. I also developed two (A & B) different seating arrangements for Prototype 3 to compare and to test, which was more suitable and safe. For Seat B, I used the same design for the desk but extended the shape of Seat A to provide extra support for the seat. In this design I introduced foam to make the seat more comfortable. After installing and doing some tests with these two seats, I have found the design in seat A to be better and safer than seat B, because seat B does not give the same stability (Fig. 97).

Fig. 96 - Design 5.4 for Prototype 3(A).

Fig. 97 - Design 5.4 for Prototype 3(B).

In Prototype 4 (Fig. 98), I introduced a wave pattern into the design. This Prototype is much simpler than Prototype 3. Originally I planned a backrest, however I found out that this function was not suitable because it became a barrier for the user to move in and out of the seating space.

Fig. 98 - Design 5.5 for Prototype 4 with wave shape.

Phase 7: Prototype Testing for Angles 0º, 5º ,10º and 15º.

I also considered the best angle for the student to sit. Mandel discusses the appropriate angles at which students should be seated[67], however the angle will be different when the student sits in a cross-legged sitting position. I set about experimenting on the student's position when the seat is placed at four different angles (0º, 5º, 10º, 15º) with Prototype 3. This was to ensure that a successful ergonomic solution was obtained, especially when the student is sitting in the cross-legged position.

Sitting with 0º angles:

With this angle, I found students can easily turn and move their bodies. I could see their bodies were slightly bent when sitting in the standard manner. However they were upright and have a straighter posture in the cross-legged position. In this version the footrest worked well and when the user was sitting in the European position they could easily put their feet on the footrest.

[67] A.C.Mandal. *The Seated Man Homo Sedens*. Denmark: Dafnia Publications, 1985. Print.

Fig. 99 - Sitting with 0º Angles.

Sitting with 5º angles:

It proved to be a bit difficult to move or turn the body while sitting cross-legged at a 5º angle, and makes sitters uncomfortable when using this Prototype. Their bodies become straight while sitting in the standard position and the crosslegged sitting position but if they wish to use the footrest they have to move their bodies forward.

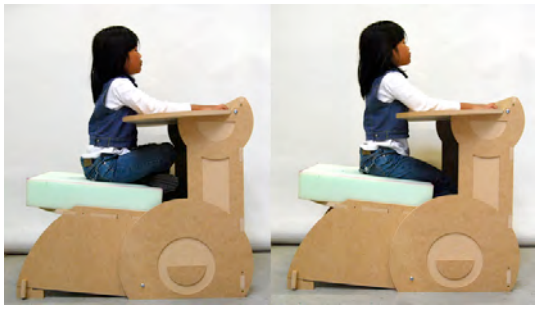

Fig. 100 - Sitting with 5º Angles.

Sitting with 10º angles:

It is difficult to sit on the seat at this angle and to move or turn their body. Sitters bodies look straight in the standard sitting position but in a cross-legged sitting position their bodies are bent forward and it makes it uncomfortable to work.

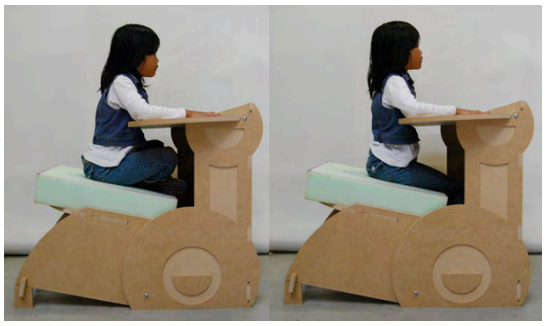

Fig. 101 - Sitting with 10º Angles.

Sitting with 15º angles:

This Prototype was obviously unsuccessful. The seat becames too high and it simply didn't comply with the British Standard; for instance, feet could not be placed on the footrest.

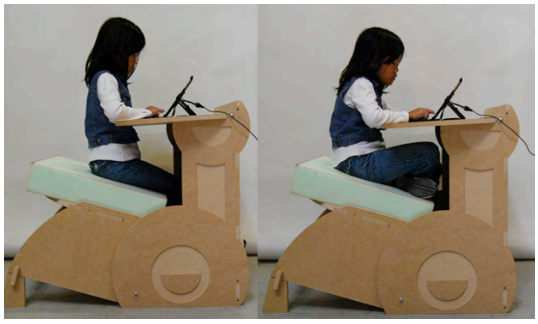

Fig. 102 - Sitting with 15º Angles.

Phase 8: Redesign the Idea

After these tests and the ensuing discussions, I decided to redesign the idea from Prototypes 3 and 4. A few parts were redesigned, including several related to the seating. I decided to continue to use the angle 0º for my design, because with this angle the student easily moved around and could sit in the cross-legged sitting position. This decision was supported by Tiedeman in his research, where he lists five benefits to his type of chair and one of it above excellent mobility[68]. The modified Prototype has a slightly extended seating area in order to provide further comfort, space and ease of movement. All parts of the desk top and chair were synchronized to enhance the aesthetics of the design. With this idea in mind, I developed a new Prototype that had the same function as others but with some modifications of the shape.

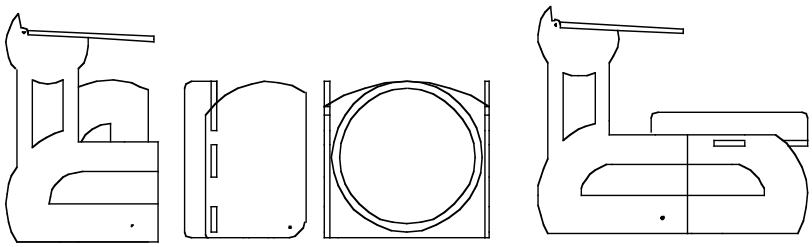

Fig. 103 - Design 5.6 was developed from Prototype 3 and 4.

[68] J.Tiedeman. "*New Concepts in Seating*." 1–6. Print.

In this Design 5.6, I created a backrest as an accessory. It was developed to extend from the seat compartment and to be easily stored (Fig. 104), but I eventually scrapped the idea because when the student was using the workstation they ignored it[69]. This was something that Breithecker had also observed in his study[70].

Fig. 104 - Backrest for Prototype 5 only functions as an accessory.
The backrest panel slots in under the seat compartment.

I gained a lot of encouragement from Prototype 5 and in Prototype 6, I worked on providing a fully resolved storage compartment[71]. The reasons for developing this were twofold: first of all, the area under the seat is very suitable as a storage area and secondly, I liked the idea that this would provide a link to the kindergarten workstation. With a fitted back-lid for the storage compartment, it has created the possibility of using the workstation as a tall seat when it is in its stacked position. On the left and right side of the sitting space, I created large and graphic handles to provide comfort for the holder to fold out and fold in the seat. When the workstation is packed, the desk panel can be lifted to create a backrest when the sitter uses the armchair sitting position and the table panel holder will serve as arm support. The desk panel holder also has a handle on the left and right to allow the user to lift the workstation.

[55] R. R. E. E. Motmans. "*Evaluation of Three Types of School Furniture According to prEN 1729.*" (1900): n. pag. Print.
[70] Federal Working Group. "*Ergonomics - a Subject for the School as Place of Work ?*". Print.
[71] R. Lueder and V. J. Berg. *Ergonomics for Children: Designing Products and Places for Toddler to Teens*. Taylor & Francis. p.680. Print.

The desk panel can be used either as a writing/computing table or as a drawing board and when thinking about what would be needed during drawing activities I considered a multifunction stationery holder. This was not only able be used to put equipment on but would also work as a locking device for the drawing panel (Fig. 105). This would ensure that the drawing panel would not fold down inadvertently when the student was drawing or painting.

Fig. 105 – Stationery holder (left) and front panel as a Hanger (right).

I also designed the front panel to function as a major fastener for the desk compartment and added some functionality. The front panel had a hanger (Fig. 105 on right) for the school bag and students could choose to hang this on the front or inside of workstation. In this design, there was no backrest so it would give more flexibility. According from Breithecker[72], if we want the students to stay active and focused they have to be able to move even when seated and with this workstation idea I deliberately kept this in mind. Even though I am anticipating that students will sit cross-legged at the workstation for a lot of the time, they can easily change the way they sit and can move into a completely different seating position every time they start to lose their focus. It appears that these movements will occur relatively seamlessly. I have included a fitted foam section on the seat that is covered with fabric and this will give comfort when sitting in cross-legged. This is a significant change from the kindergarten workstation where I am anticipating that children will probably like to bring their own cushion/ 'comforters' for their own station.

[72] D. Breithecker. "*Beware the Sitting Trap In Learning and Schooling*." *Design Share*. 2009. Web. 13 Nov. 2009.

Fig. 106 - Design 5.7 for Prototype 6.

With the ideas that have been incorporated into Design 5, I was satisfied that I had gone a long way towards resolving many of the issues of the earlier Prototypes. All shapes in this form were created to make it simpler, to synchronize the form and function. The design concept was drawn from organic form to make the workstation aesthetically appealing and to also make it user friendly. In order to maintain a low cost for mass production, I worked to minimize the amount of *gaboon* plywood to make it economical. The new workstation had 4 wheels to make it easy to move and it could be easily arranged to any classroom plan. I chose a plastic castor that can support more than 40kg and to make the wheel movement smooth, I chose aluminum wheel bearings and an aluminum stud. This design was made for students age 8 years old to 11 years old, so I produced a desk with 640mm height and about 380 mm for seat height level. This is based on the British Standard (Fig. 59). For the foam thickness, I chose 50 mm thickness to be compatible with the seat height level. In this Prototype, there were still some flaws in the resolution of the seat and I had a problem with the stationery holder, because it uses a latch to lock it. There was the possibility that the latch hole would become loose over time.

The next step after identifying the problems in Prototype 6 was to continue to redesign Prototype 6 to a further Prototype by maintaining the concept of Design 5. For Prototype 7 I had to resolve the issues that in Prototype 6 including the stationery holder component. In the design for Prototype 7, I attached the stationery holder to the desk panel holder by using a screw and dovetail, and it

also became fasteners for that parts (Fig. 108). This stationery panel was developed to accommodate the shape with the back of the user's body in order to provide comfort to the user while leaning on the drawing panel. Meanwhile, to avoid the drawing panel from folding down inadvertently, I tilted the drawing panel retainer 9º and also used the ball-catch as the locking system to lock the table panel. This became an extra holder for the table panel to remain in position. The foam size for the seat was enlarged and the handle for the seat compartment was slightly modified to make the shape more effective with the overall form of the workstation. To complement this design I need to include some colour and I chose to use green and light grey on Prototype 7. Another reason that I used two colours on Prototype 7 was as an indicator to the user that these designs have two components, the chair and desk. I am very satisfied with the results of these modifications.

Fig. 107 - Design 5.8 for Prototype 7. Seated fold-down and with colour.

Fig. 108 - Stationare holder panel in Prototype 7 can also hold a cup.

At the time of writing, after completing Prototype 7, I created Prototype 8 over the summer of 2012 – 2013 that was taken to Albuera Street Primary School in Hobart, Tasmania for tests to be carried out with students and to get a response from students. In this Prototype, a slight modification was made in the front panel of the Prototype. I changed the shape from eight small holes that formed into circle to two half circular shapes, so that the shape is not only aesthetically pleasing but the semi-circles can also be used as a handle to move the workstation. Under the seat section I also created a handle for the user to make it easier when lifting the seat. 30mm foam has replaced the 50mm foam for this Prototype; this is to enable the sitter to move easily. There are several copies of this Prototype that have been produced and each one uses different colours in red, yellow, blue and green, while I have chosen to use dark grey for several parts such as the desk panel and at the front panel.

Fig. 109 - Prototype 8 with colour proposal and arrangement.

Material and Processes

Experiments with MULTICAM

When I commenced the research, I focused on traditional design-maker techniques to develop the early Prototypes but several months into my candidature, the School of Art acquired a state-of-the-art Computer Numerical Control (CNC) Router which caused me to change my approach in a radical

fashion and enabled me to produce precise and repeatable components[73]. The early Prototypes using the manual methods were quite limited and to produce a product required a great number of extra steps.

The steps that have been done when generating the Prototype with manual methods are as follows. Firstly, after finalizing the design, I needed to produce technical drawings in the scale 1:1; these drawings serve as a template for cutting MDF sheet and all measurements have to be produced exactly in the mold. A large table saw was used to make these Prototypes and it meant that each component had to be designed with an additional 3mm to the template edge to allow for the saw cut. This was to ensure that the measurement after the cut was still in the required size. Some parts had to be split into two pieces because the table-saw could not produce the forms. In this process the parts had be merged by using a 'biscuit' (joint method) and glue. After completing this process, the next step was to drill a screw hole for the jointing process. Once again the use of mold is applicable, to ensure that each hole is drilled in the right place. The next step was to finish the inner connection and this step had to be done especially carefully particularly with all the dovetail joints. After going through all the stages and steps of producing this Prototype manually, I analyzed of the drawback of using this method.

When producing the Prototype by using the table saw, there was a lot of surplus material during this process and this process was highly inappropriate because the use of extra materials increased the cost of the product. Production should also be precise because a slight error when using any machines, would involve increased cost of products manufactured. Each Prototype was taking a long period and this would increase the time for production.

[73] R. Baker. *Designing the Future*. London: Thames and Hudson, 1993.p.56.

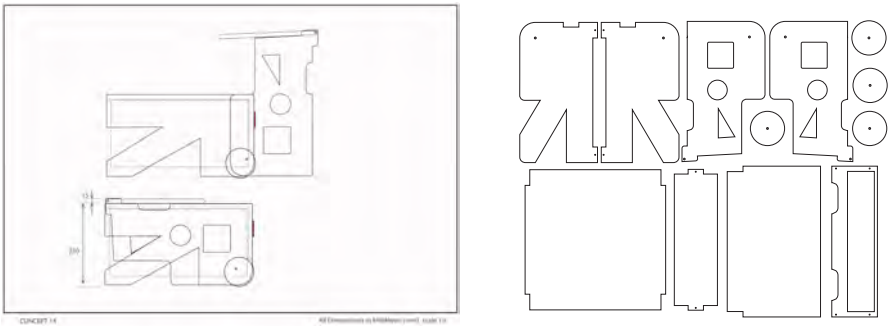

Fig. 110 – My technical drawings were converted into 2D shapes for cutting process. Left image show the technical drawing and the right image shows the 2D shape for every panel/part.

Thinking from a marketing point of view, I replaced the manual methods with an automatic machine or router process. The Art School's MULTICAM S2412i was used to produce the next Prototypes. To begin the process of applying the CNC router, I had to transfer my 2D drawings created by Adobe Illustrator CS4 software to AutoCAD 2010. Even though MUTICAM S2412i software is able to read files from Adobe Illustrator, by using the AutoCAD I can get a more detailed measurement. All the design that have been produced have been rendered as individual 2D forms in order to facilitate (Fig. 110), the MUTICAM S2412i cutting process.

By using MUTICAM S2412i each piece of *gaboon* plywood (1220 mm x 2440 mm) is able to produce two kindergarten Prototypes and one primary Prototype. This is very economical and it takes only 30 minutes to cut a *gaboon* plywood sheet to be ready to assembly. Through this CNC router process, saved production time and saved materials are very significant, and it is a very good alternative for the production of *bersila* Prototype.

Fig. 111 – Myself with MUTICAM S2412i in cutting process.

The next stage, after the doctoral research, will be to look at other industrial processes such as plastic injection and plastics moulding. Both of these processes are good for the production of large numbers and I am confident that I can take the Prototypes already designed in this research project into this next stage. In the meantime, it has been the aim of this research to develop a new concept of furniture by using a form of cross-legged sitting position, and for that reason I used the most available advanced processes that were immediately available to me. Using a MUTICAM S2412i machine has made it possible to produce large enough numbers of the product to demonstrate what the furniture might look like in bulk once the capability offered by plastic injection process and plastics moulding is introduced. Another reason to use the MUTICAM S2412i machine is that it is an excellent machine to employ when making wood products.

Experiments with materials

At the beginning of the Prototype development, I was using a Medium Density Fibreboard (MDF) as the main material and this material was not really appropriate because of its lack of water resistance and its heaviness. Those qualities are important for my design because it involves children, and the criteria that I set in my designs are that they were relatively lightweight and waterproof. As explained before, I have selected *gaboon* Plywood (Fig. 4) because it has been very appropriate for my design criteria.

Gaboon is a kind of marine plywood and lighter than MDF board and 25% lighter than other plywood. The *gaboon* type of timber comes from the West African republic of Gabon; elsewhere it is known as *Okoume*[74]. *Gaboon* is also very suitable for use with MUTICAM S2412i machines.

[74] M. Beazley. "*Gaboon*." Web. 5 Feb. 2013.

Fig. 113 – Albuera Street Primary School using a Uniboard as their front gate.

In the third year of my research, I discovered a Uniboard which is also suitable as an alternative to replace *gaboon* plywood as materials to produce the *Bersila* Prototype. Uniboard is a flat sheet of recycled plastic and it is a marine ply that comes with variety colors. It is a combination of recycled plastic in High Density Polyethylene (HDPE) and Polypropylene (PP). The advantage of Uniboard is the low weight of the material, it very low moisture absorption, its high mechanical strength, its chemical resistance, and the fact that it is waterproof and what is more, it can be easily used with MUTICAM S2412i like *gaboon*. After obtaining a sample, I have experimented with several pieces to ensure the suitability of this material to the production *Bersila* Prototype and it appears this material perfectly adequate for my needs. This will be the next stage in the development of the workstation for production when I return to Malaysia. For the purposes of this research project however, I have resolved to stick with *gaboon* ply.

CHAPTER 4: CONCLUSION

In early 2013, I had the opportunity to test run the *bersila* primary school workstation design at Albuera Street Primary School, in Hobart, Tasmania. The goals of the testing were to identify the extent to which primary school students would interact with the final design and also to look at how local students adapted to using furniture that allowed them to sit cross-legged. A total of 20 students were selected from a Grade 2 class at Albuera Street Primary School and since only four workstations were provided for this process of documentation, students had to take turns so that all the students involved were able to try out and to explore the workstation. The four workstations were in four different colours consisting of red, blue, yellow and green. The color selection was based on the use of colours in the *bersila* kindergarten design that I had previously worked on.

Throughout this testing process, I received excellent cooperation from the school management and also among students. In documenting this process I used both video recording and digital image recording, which proved enough to obtain the information about the reaction of the students while using the workstation.

In giving an overview of the workstation at the school and why it had been developed, it was obvious that this was a new concept both to the staff and students; but during this introduction the students began to realize that the workstation could be more than a single-function workplace; rather it had many functions and enabled the student not only to sit in the *bersila* positions but it has the flexibility to be used comfortably in a variety of other sitting positions. Students explored the typical qualities of the workstation but they soon began to explore its other uses, treating it as an easel (which is one of its design functions) and even as an armchair in its folded state. The students seemed to adapt to the workstation's flexibility very quickly and the documentation suggests that the workstation's design is effective and that all the functions can be used. There appeared to be no issues regarding its safety, suggesting that the design solutions I have addressed with this in mind are satisfactory.

Observations about the student interaction:

- The students arranged the workstations easily into suitable positions in the classroom and the four wheels on the design functioned effectively and the workstation was moved smoothly.
- Students appeared to access the workstation intuitively even if this was their first time.
- The workstation proved to be a very flexible sitting platform with students sitting in various positions and able quickly to change seating positions seamlessly and comfortably.
- The written guide that has been created appears to be working well and provides students with the correct information they need to use the workstation safely.
- Even when students are not used to sitting in the cross-legged sitting position, it is clear that this hasn't affected their ability to use the workstation effectively and, as the documentation shows, they found a wide variety of sitting positions to adopt, suggesting that the design can work well for those who are not used to sitting cross-legged.
- The students appeared to respond very positively to the colour scheme of the workstations.
- Although I had originally designed the easel to be in a position suitable for students who are painting and drawing, it was pleasing to see that the students were also using the easel position in order to read.
- As a result of the test-run, the teacher suggested the workstation should incorporate a special pencil holder or pencil space. I have noted this for the future.

When I introduced the workstation design to students and teachers, they were engaged and it was reassuring to see that such a design has broad appeal. Although the goal of this workstation design has focused on potential users in Malaysia and the surrounding region, it is pleasing that the concept of sitting cross-legged on a chair comes relatively easily to children elsewhere.

Fig. 113 – Primary Workstation Design at Albuera Street Primary School, Hobart, Tasmania.

Fig. 114 – Student sitting cross-legged and W-sitting on workstation.

Fig. 115 – Student using a workstation as armchair.

As I have noted in the Abstract that summarizes this research project, the investigation has centered upon developing a body of furniture that takes into account the typical Malaysian sitting called *bersila* or the cross-legged sitting position, which is common in most Asian cultures. The aim has been to foster the continuing use of *bersila*, particularly amongst young Malays. The early formative years of schooling were chosen for the development of a versatile workstation designed to facilitate the *bersila* sitting.

The exegesis that accompanies this practical submission has examined the cultural and the design context in the first two chapters. It has been noted, for instance, that cross-legged seating is a common form of seating in many countries and that people have found a number of simple aids to facilitate the practice. In Chapter 1, I have explored the cross-legged seating position not only in its Malaysian historical context but have investigated its use in other countries where it is known by a variety of other names. In Chapter 2, I look at the work of a number of designers who have developed furniture that has had an influence on my own thinking and I have taken particular note of those designs that have been adopted for seating related to yoga. For yoga there is a relatively wide selection of chairs that have been produced; however the design scope seems generally to be confined to adults and yoga practitioners themselves. As this project demonstrates, I have focused my attention on early childhood education. The resulting designs have also taken account of the design standards required for educational seating in Malaysia and elsewhere.

Chapter 3 focuses on how the project was pursued and, as the Abstract describes, the process involved an exploration of the following criteria that underpinned an investigation that set out to develop a form of seating suitable for the early years of schooling.

These include:

- Suitability for low cost mass production.
- The use of economic materials.
- Robust construction.
- Ease of maneuver and stability.
- Safe handling by young people.
- Flexible use to suit various classroom activities.
- Flat packing to aid distribution.

In Chapter 3, I sought to address these design problems and the practical solutions I have arrived at during the research project.

As I have described in the Abstract, the significance of the project is its tangible contribution to Malaysian culture. The *bersila* sitting position is a part of Malaysian and other Asian cultural identities as well as having ergonomic and life style benefits. I have set out to develop a furniture concept that focuses on cross-legged seating, whereas the vast majority of seating designs focus upon a Western style of seating. As I have shown, this latter Western form of seating is now typical in schools and in the home and the office, even though Malaysians will often try to find ways in which to sit cross-legged at school desks, watching television and reading, for instance, and when working in an office. Appropriate and comfortable solutions to this problem are rare and so this project outcome is an example of finding a design solution to meet cultural and lifestyle needs.

The tangible results are two workstations (*bersila* kindergarten workstation and *bersila* primary workstation) that are suitable to the growing needs of kindergarten and primary school students. As noted, the furniture ideas have been tested in classrooms in Malaysia and Australia and the outcomes of the research demonstrate that the research project has the capacity to be introduced widely in the Malaysian education system, creating a versatile and flexible seating system at an important formative time in children's development.

As this three-year investigation concludes, I am keen to return to Malaysia to explore the possibility of introducing this design into schools and I have also begun to think of the design's wider application. I made the point in the Abstract that Malaysia is situated at the centre of a billion strong population in a group of nations with a climate of economic growth due in part to the rising middle class. This indicates a demand for larger furnished homes and there is status implied to furniture and particularly to seating. However, as I have shown, these populations also have long standing traditions that include the *bersila* seating position and I have begun to think of other designs that have the potential to cater for both *bersila* and Western sitting. The following sketches give some idea of where my thinking is going in this regard:

Fig. 116 – Future design for adult workstation

The production of an appropriate workstation for adults that can be used in the office and at home excites me and could provide a workable solution allowing an easy transition to occur between the European sitting position and the cross-legged sitting that is so common in Asia. That may be my next design project. In the meantime, the aim will be to explore the potential for developing the current three-year research project and the designs that have been created to production status in Malaysia.

APPENDICES A: LIST OF ILLUSTRATIONS

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67 Abdul Aziz, *Proportion between students, how the Prototype 2 work and the weakness at writing panel*. 2009.

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69 Abdul Aziz, *How Mock-up 4.2 work.* 2009.

70 Abdul Aziz, *Mock-up 4.2 Experiments with Difference Hinging.* 2010.

71 Abdul Aziz, *How to use the Prototype 3*. 2010.

72 Abdul Aziz, *Prototype 4 detailing*. 2010.

73 Abdul Aziz, *Gaboon Marine Plywood (15mm, 7 ply, size 1220x2440).* 2010.

74 Abdul Aziz, *Prototype 5 and 6 detailing.* 2010.

75 Abdul Aziz, *Ergonomic hander for Prototype 5 and 6.* 2010.

76 Abdul Aziz, *'Seeing Double' Exhibition at Hobart*. 2010.

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79 Abdul Aziz, *Prototype 8 At Kindergarten classroom at Tanjong Malim Perak, Malaysia*. 2011

80 Abdul Aziz, *Kindergarten Children using the Prototype 8 during testing in Malaysia.* 2011.

81 Abdul Aziz, *'Connector' also can be as stationery holder*. 2011.

82 Abdul Aziz, *The images show how to connect the Prototype by using the 'Connector'*. 2011.

83 Abdul Aziz, *Student with Prototype 9*. 2011.

84 Abdul Aziz, *Footrest panel*. 2011.

85 Abdul Aziz, *Footrest panel, Connector Bolt and Ball Catch*. 2011.

86 Abdul Aziz, *Prototype 10, Design for kindergarten furniture*. 2011.

87 Abdul Aziz, *Handle at Prototype 11 give extra function to this design*. 2011.

88 Abdul Aziz, *Sketches a Design for Primary Level Workstation.* 2011.

89 Abdul Aziz, *Detail Drawing*. 2011.

90 Abdul Aziz, *Mock-up for Design 1.1, 1.2, 1.3, 1.4, 2, 3 and 4 (Chair Accessories). The first row shows the adjustable thigh rests; the second row shows the flip-up desk and seating platform suitable for cross-legged sitting platform with adjustable thigh supports and the 'Kangaroo' design.* 2011.

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95 Abdul Aziz, *Design 5.3 Prototype 2 with a backrest was created as an accessory*. 2011.

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97 Abdul Aziz, *Design 5.4 for Prototype 3(B).* 2012.

98 Abdul Aziz, *Design 5.5 for Prototype 4 with wave shape*. 2012.

99 Abdul Aziz, *Sitting with 0º Angles*. 2012.

100 Abdul Aziz, *Sitting with 5º Angles.* 2012.

101 Abdul Aziz, *Sitting with 10º Angles*. 2012.

102 Abdul Aziz, *Sitting with 15º Angles.* 2012.

103 Abdul Aziz, *Design 5.6 was Develops from Prototype 3 and 4*. 2012.

104 Abdul Aziz, *Backrest for Prototype 5 only function as accessories. The backrest panel will be slot in under the seat compartment*. 2012.

105 Abdul Aziz, *Stationery holder (left) and Front Panel as a Hanger (right).* 2012.

106 Abdul Aziz, *Design 5.7 for Prototype 6*. 2012.

107 Abdul Aziz, *Design 5.8 for Prototype 7; Seated fold-down and with colour*. 2012.

108 Abdul Aziz, *Stationary holder panel in Prototypes 7 can also hold a cup*. 2012.

109 Abdul Aziz, *Prototype 8 with colour proposal and arrangement*. 2012.

110 Abdul Aziz, *My design Technical Drawing was converting into 2D shape for cutting process. Left image show the technical drawing and the right image show the 2D shape for every panel/part.* 2012.

111 Abdul Aziz, *Myself with MUTICAM S2412i in cutting process*. 2012.

112 Abdul Aziz, *Albuera Street Primary School using a Uniboard as their front gate*. 2012.

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114 Abdul Aziz, *Student sitting cross-legged and W-sitting on workstation*. 2013.

115 Abdul Aziz, *Student using a workstation as armchair*.2013.

116 Abdul Aziz, *Future design for adult workstation*. 2013.

APPENDICES B: BIBLIOGRAPHY

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APPENDICES D: APPROVAL LETTER

UNIT PERANCANG EKONOMI
Economic Planning Unit
JABATAN PERDANA MENTERI
Prime Minister's Department
BLOK B5 & B6
PUSAT PENTADBIRAN KERAJAAN PERSEKUTUAN
62502 PUTRAJAYA
MALAYSIA

Telefon : 603-8872 3333

Ruj. Tuan:
Your Ref.:

Ruj. Kami: UPE: 40/200/19/2755
Our Ref.:

Tarikh: 26 Januari 2011
Date:

Abdul Aziz bin Zalay @ Zali
12/11 Lynton Ave
Dynnyrne South Hobart
7005 Tas, Australia
Email: *ariz9000@yahoo.com*

APPLICATION TO CONDUCT RESEARCH IN MALAYSIA

With reference to your application, I am pleased to inform you that your application to conduct research in Malaysia has been *approved* by the **Research Promotion and Co-Ordination Committee, Economic Planning Unit, Prime Minister's Department.** The details of the approval are as follows:

Researcher's name	:	**ABDUL AZIZ ZALAY@ ZALI**
Passport No. / I. C No:		**741220-07-5791**
Nationality	:	**MALAYSIA**
Title of Research	:	**"BERSILA + AN INVESTIGATION OF NEW FORMS FOR KINDERGARTEN"**
Period of Research Approved:		**36 MONTHS**

2. Please collect your Research Pass in person from the Economic Planning Unit, Prime Minister's Department, Parcel B, Level 4 Block B5, Federal Government Administrative Centre, 62502 Putrajaya, Malaysia and bring along two (2) passport size photographs.

3. Please take note that the study should avoid sensitive issues pertaining to local values and norms as well as political elements while undertaking your research project in Malaysia. You have to adhere to the conditions stated by the code of conduct for foreign researchers. You are also required to comply with the rules and regulations

stipulated from time to time by the agencies with which you have dealings in the conduct of your research.

4. I would like to draw your attention to the undertaking signed by you that you will submit without cost to the Economic Planning Unit the following documents:

a) A brief summary of your research findings on completion of your research and before you leave Malaysia; and

b) Three (3) copies of your final dissertation/publication.

5. Lastly, please submit a copy of your preliminary and final report directly to the State Government where you carried out your research. Thank you.

Yours sincerely,

(MUNIRAH BT. ABD MANAN)
For Director General,
Economic Planning Unit.
E-mail: munirah@epu.gov.my
Tel: 88725281/88725272
Fax: 88883961

ATTENTION

This letter is only to inform you the status of your application and **cannot be used as a research pass.**

Private Bag 57 Hobart
Tasmania Australia 7001
Centre for the Arts, Hunter Street
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TASMANIAN SCHOOL OF ART

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Puan Mimi,
Sila beri kerjasama. Haniz

Prof. Madya Dr. Haniz Ibrahim
Jabatan Pendidikan Khas
Fakulti Sains Kognitif
& Pembangunan Manusia
Universiti Pendidikan Sultan Idris

Tuesday, 30 November 2010

To Whom it May Concern: Abdul Aziz Zalay.
Request to undertake field work observation in Malayasia, February-March, 2011

Mr Abdul Aziz Zalay is currently enrolled in a PhD at the University of Tasmania's School of Art. Mr Aziz has just completed the first year of his research and has recently presented an excellent submission to the School's Postgraduate Forum, reporting on the progress of his project in 2010.

Mr Aziz's is investigating the potential of a new type of work station that can be introduced into kindergarten classrooms. Kindergarten furniture (indeed all primary school furniture) in Malaysia is modelled on furniture that is commonly found in Western classrooms even though, when given the option, the majority of Malaysian school children will sit cross-legged on the floor. Although a great deal of kindergarten learning activity is carried out on the floor, much of the more formal learning occurs while children are seated at desks, computer work stations and grouped tables. This research project investigates the potential to create an inexpensive and safe workstation that is flexible, hardy and easily moveable by the children. A successful outcome of this project has the potential to be widely implemented in classrooms in South East Asia.

The investigation has thus involved Mr Aziz in developing a number of prototypes of the work station and the most recent prototype is ready to be tested in the classroom environment. The prototype and drawings are specifically designed so that the work station can be manufactured using a computer-aided router. It can be transported as a flat pack.

Mr Aziz is about to embark on the next stage of the investigation. First, he will be introducing the work station into the classrooms of two primary schools, one in Hobart, Tasmania (Albuera St Primary School) and the other in Tanjong Malim, Perak (Tadika Cemerlang Primary School) early in 2011. Ethics clearance is being sought for this part investigation and the aim will be to observe how children respond to the introduction of this new kind of furniture into the school environment. The second focus with be the further development of the work station in increasingly sophisticated prototypes and variations.

As noted, Mr Aziz is proposing to test out this work station by intrroducing it into classrooms in Tasmania and Perak. The application to undertake field work in Perak has my strong support and the observations that come out of the field work will form an important part of the reporting process that comes when Mr Aziz's thesis is submitted.

Yours sincerely,

Professor Jonathan Holmes
Tasmanian School of Art, University of Tasmania

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Mr Abdul Aziz Zalay is currently enrolled in a PhD at the University of Tasmania's School of Art. Mr Aziz has just completed the first year of his research and has recently presented an excellent submission to the School's Postgraduate Forum, reporting on the progress of his project in 2010.

Mr Aziz's is investigating the potential of a new type of work station that can be introduced into kindergarten classrooms. Kindergarten furniture (indeed all primary school furniture) in Malaysia is modelled on furniture that is commonly found in Western classrooms even though, when given the option, the majority of Malaysian school children will sit cross-legged on the floor. Although a great deal of kindergarten learning activity is carried out on the floor, much of the more formal learning occurs while children are seated at desks, computer work stations and grouped tables. This research project investigates the potential to create an inexpensive and safe workstation that is flexible, hardy and easily moveable by the children. A successful outcome of this project has the potential to be widely implemented in classrooms in South East Asia.

The investigation has thus involved Mr Aziz in developing a number of prototypes of the work station and the most recent prototype is ready to be tested in the classroom environment. The prototype and drawings are specifically designed so that the work station can be manufactured using a computer-aided router. It can be transported as a flat pack.

Mr Aziz is about to embark on the next stage of the investigation. First, he will be introducing the work station into the classrooms of two primary schools, one in Hobart, Tasmania (Albuera St Primary School) and the other in Tanjong Malim, Perak (Tadika Cemerlang Primary School) early in 2011. Ethics clearance is being sought for this part investigation and the aim will be to observe how children respond to the introduction of this new kind of furniture into the school environment. The second focus with be the further development of the work station in increasingly sophisticated prototypes and variations.

As noted, Mr Aziz is proposing to test out this work station by intrroducing it into classrooms in Tasmania and Perak. The application to undertake field work in Perak has my strong support and the observations that come out of the field work will form an important part of the reporting process that comes when Mr Aziz's thesis is submitted.

Yours sincerely,

Professor Jonathan Holmes
Tasmanian School of Art, University of Tasmania

Approved

Tadika ABim
TG Malim Perak
Malaysia

Social Science Ethics Officer
Private Bag 01 Hobart
Tasmania 7001 Australia
Tel: (03) 6226 1832
Fax: (03) 6226 7148
Marilyn.pugsley@utas.edu.au

HUMAN RESEARCH ETHICS COMMITTEE (TASMANIA) NETWORK

20 May 2011

Professor Jonathan Holmes
Art (Hobart)
Private Bag 57
Hobart Tasmania

Dear Professor Holmes

Re: FULL ETHICS APPLICATION APPROVAL
Ethics Ref: H0011608 - 'Bersila' + An investigation of new furniture forms for Kindergarten classrooms.

We are pleased to advise that the Tasmania Social Sciences Human Research Ethics Committee approved the above project on 20 May 2011.

Please note that this approval is for four years and is conditional upon receipt of an annual Progress Report. Ethics approval for this project will lapse if a Progress Report is not submitted.

The following conditions apply to this approval. Failure to abide by these conditions may result in suspension or discontinuation of approval.

1. It is the responsibility of the Chief Investigator to ensure that all investigators are aware of the terms of approval, to ensure the project is conducted as approved by the Ethics Committee, and to notify the Committee if any investigators are added to, or cease involvement with, the project.

2. Complaints: If any complaints are received or ethical issues arise during the course of the project, investigators should advise the Executive Officer of the Ethics Committee on 03 6226 7479 or human.ethics@utas.edu.au.

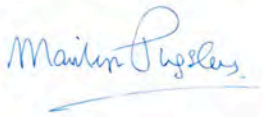
3. Incidents or adverse effects: Investigators should notify the Ethics Committee immediately of any serious or unexpected adverse effects on participants or unforeseen events affecting the ethical acceptability of the project.

4. Amendments to Project: Modifications to the project must not proceed until approval is obtained from the Ethics Committee. Please submit an Amendment Form (available on our website) to notify the Ethics Committee of the proposed modifications.

5. Annual Report: Continued approval for this project is dependent on the submission of a Progress Report by the anniversary date of your approval. You will be sent a courtesy reminder closer to this date. **Failure to submit a Progress Report will mean that ethics approval for this project will lapse.**

6. Final Report: A Final Report and a copy of any published material arising from the project, either in full or abstract, must be provided at the end of the project.

Yours sincerely



Marilyn Pugsley
Ethics Officer

Department of Education
EDUCATIONAL PERFORMANCE SERVICES

2/73 Murray Street, Hobart
GPO Box 169, Hobart, TAS 7001 Australia

Tasmania

20 February 2013

Mr Abdul Aziz Zalay
PhD Candidate
4/11 Lynton Ave
South Hobart, TAS 7000

Dear Mr Zalay

'Bersila' + An investigation of new furniture forms for kindergarten classrooms.

I have been advised by the Educational Performance Report Committee that the above research study adheres to the guidelines established and that there is no objection to the study proceeding.

Please note that you have been given permission to contact Albuera Street Primary School. You will still need to seek permission from the principal of the school involved in the study.

As per telephone discussions and email correspondence you must ensure that the parent of each student who takes part in this research has a signed Consent Form and Deed of Release form. These signed copies are to be held at the school office.

A copy of your final report should be forwarded to Educational Performance Services, Department of Education, GPO Box 169, Hobart, 7001 at your earliest convenience and within six months of the completion of the research phase.

Yours sincerely

Tony Luttrell

Manager
(Educational Performance Services)
CC: Professor Jonathan Holmes; (holmes@utas.edu.au)

CONSENT FORM
Title of Project: 'Bersila' + an investigation of new furniture forms for kindergarten classrooms

I have read and understood the 'Information Sheet' for this project.

The nature and possible effects of the study have been explained to me.

I understand that the study involves my child using the particular workstation during normal classroom activities for a period of one or two days.

Because the work station has an articulated desk-top that folds away, I understand that participation involves the risk that without supervision, my child could be injured if the easy-to-understand instructions for use of the work station are not followed. I note that each child will be instructed on how to store the furniture and the likelihood of injury occurring is approximately the same as the likelihood of children jamming fingers between tables when arranging the classroom furniture.

I understand that all research data will be securely stored on the University of Tasmania premises until the end of 2015, and will then be destroyed.

Any questions that I have asked have been answered to my satisfaction.

I agree that research data gathered from my child for the study may be published in the written PhD submission as photographs and in video form provided that my child is not identified as a participant.

I understand that the researchers will maintain my child's anonymity and that any information supplied to the researcher(s) will be used only for the purposes of the research.

I agree to allow the participation of my child in this investigation and understand that I may withdraw my consent at any time without any effect and, if I so wish, I may request that any data relating to my child be withdrawn from the research. I note that this research project is not a Department of Education activity [DoE] and no liability rests with the DoE if the child falls off or is injured by the equipment but that, for insurance purposes, the research project is covered by the University of Tasmania under its 'insurance for work- integrated learning projects'.

Name of Student:	Name of Parent or Guardian Signature: Date:

Statement by Investigator
I have explained the project & the implications of participation in it to this volunteer and I believe that the consent is informed and that he/she understands the implications of participation

If the Investigator has not had an opportunity to talk to participants prior to them participating, the following must be ticked.

The participant has received the Information Sheet where my details have been provided so participants have the opportunity to contact me prior to consenting to participate in this project.

Name of Investigator:	Signature of Investigator Date

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Tasmania Australia 7001
Centre for the Arts, Hunter Street
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www.artschool.utas.edu.au

TASMANIAN SCHOOL OF ART

UTAS

UNIVERSITY OF TASMANIA

19 February, 2013

PARTICIPANT INFORMATION SHEET SOCIAL SCIENCE/ HUMANITIES RESEARCH

Primary school workstation project

Information Sheet
Mr Abdul Aziz Zalay

Invitation
We are writing to seek your permission for your child to participate in a research study into the design of a new primary school work-station.

The study is being conducted by PhD research candidate, Mr Abdul Aziz Zalay under the supervision of Professor Jonathan Holmes, Tasmanian School of Art, University of Tasmania

1. 'What is the purpose of this study?'
The purpose is to develop a new design for a workstation that can be introduced into primary schools here in Australia and in Malaysia. The easily stored workstation is being designed in such a way that it enables students to adopt the 'bersila' or cross- legged seating position, which is commonly used not only by children but also by adults in many Asian countries.

2. 'Why have I been invited to participate in this study?'
Your child has been invited because he/she is a student at the selected primary school, Albuera St Primary School, Battery Point, Hobart. The students in the class (including your child) are invited to test this workstation over a short period of time so that Mr Zalay can observe the ways in which students adapt to and work with this new piece of furniture. It is expected that students will be asked to work with the workstation for less than half a day.

4. 'What does this study involve?'
Several protoypes have been developed during the past two years and the project has now reached the stage where Mr Aziz needs to observe how children will respond to the introduction of the workstation into the classroom environment. While much activity in the classroom is carried out on the floor, there are some activities that require that the children be seated at a table or desk. Mr Aziz needs to be able to observe how the children use the workstation, which offers them the opportunity to adopt the cross- legged seating position or to seat themselves in the conventional Western manner. Mr Aziz will be assessing the appropriateness of the current design, whether there are design flaws in the current prototype, whether the design is suitably robust in the classroom environment and whether the workstation can be easily stored by the children when not in use. There will also be some observation of the workstation's impact on classroom activity and the classroom's spatial organisation.

While the children are using the workstation Mr Aziz will be undertaking video documentation and this will be used as part of the reporting process associated with his doctoral submission. Photographs and video may be included in the written component of his thesis although it is not intended that any of the children will be identified by name at any stage in the reporting process. Photographs will be printed as low resolution and images will only be used to provide documentation of the ways in which the children interact with the workstation.

We need also to make you aware that doctoral theses at the University of Tasmania are made available to the academic community as ePrints. This means that if someone wishes to view Mr Zalay's written submission they have the opportunity to search the University catalogue and apply to obtain a copy. This is one further reason why the images in the written submission will be of low resolution and small in size on the page.

It is important that you understand that your child's involvement in this study is voluntary. While we would be pleased to have your child's participation, we respect your right to decline. There will be no consequences for you and your child if you decide not to participate. Furthermore, if you decide to discontinue participation at any time, you may do so without providing an explanation. All information will be treated in a confidential manner, and your child's name will not be used in any publication arising out of the research. All of the documentation will be kept in a locked cabinet in the office administration at Tasmanian School of Art at the University of Tasmania and destroyed once the thesis has been submitted.

5. Are there any possible benefits from participation in this study?

We don't anticipate that there will be significant short term benefits arising from this period of observation. Rather, the long-term aim is to create a workstation that allows the student to adopt either the cross-legged seating position or the usual western-style seating position in the classroom. You may observe your child adopting the cross- legged position more readily whilst carrying out more formal activities. In the longer term it is expected that efforts will be made to take this prototype design to the production stage but this is some years away.

6. Are there any possible risks from participation in this study?

There are no specific risks anticipated with participation in this study although it will be important to show the children how to open the desk top with care. The mechanism is not complicated but, because the desk-top is hinged, students need to be made aware of its operation and potential hazards. These are similar to the potential hazards with opening and closing any hinged object. Students will be shown how to operate the mechanism of the workstation.

7. What if I have questions about this research?

If you would like to discuss any aspect of this study please feel free to contact Professor Jonathan Holmes on ph 0400601636. Once we have analysed the information we will ask the School to mail you a summary of our findings. You are welcome to contact us at that time to discuss any issue relating to the research study.

This study has been approved by the Tasmanian Social Science Human Research Ethics Committee. If you have concerns or complaints about the conduct of this

study should contact the Executive Officer of the HREC (Tasmania) Network on (03) 6226 7479 or email human.ethics@utas.edu.au. The Executive Officer is the person nominated to receive complaints from research participants. You will need to quote the following number: H11608.

Thank you for taking the time to consider this study.
If you wish to take part in it, please sign the attached consent form. This information sheet is for you to keep.

Private Bag 57 Hobart
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Dear Parent or Guardian,

You will have been given four documents related to this project.

The Consent Form
The Information Sheet
The Deed of Release
Photographs of the work-station to show you how it operates.

The **Consent** form and the **Deed of Release** form need to be signed by you in order for your child to participate in this survey. We would be very grateful if you could sign these documents if you give permission for your child to use the work-station described in the information sheet.

Mr Aziz Zalay will bring four work-stations to the classroom tomorrow morning and will be photographing the children using the furniture over a period of two hours or so.

If you give permission, please could you return the **Consent Form** and **Deed of Release** when your child comes to School tomorrow.

With best wishes,

Aziz Zalay and Jonathan Holmes

Deed of Release

Dated 2013

("Releasor")

and

The Crown in Right of Tasmania ("Crown")

The Crown Solicitor of Tasmania

Executive Building
15 Murray Street Hobart Tasmania 7000
GPO Box 825 Hobart Tasmania 7001
Telephone: (03) 6233 3922
Facsimile: (03) 6233 2874
File Ref: 41500.
Doc Ref: 2013_DR-School Workstation Deed of Release

Deed of Release

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5 Joint and several obligations 4

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Deed **of Release**

Details

Parties	**Releasor and Crown**	
Releasor	Name	**("Releasor")**
	Address	
	Telephone	
	Fax	
Crown	Name	**The Crown in Right of Tasmania** as represented by the Department of Education **("Crown")**
	Address	
	Telephone	
	Fax	
	Attention	
Recitals	**A**	The Researcher is a PhD student at the Universtiy of Tasmania.
	B	The Researcher wishes to undertake research regarding a prototype school desk in which students can sit cross-legged ("the Research").
	C	The Releasor is the parent or guardian of a student involved in the Research and has consented to the student being involved in the Research.
	D	The Crown has agreed to permit the Researcher to undertake the Research at the [Albuera Street Primary School] school ("the School") provided that the Releasor releases the Crown from all causes of action, suits and claims that may arise as a result of the Research.
	E	The Releasor has agreed to release the Crown upon the terms and conditios of this Deed.
Date of agreement	See Signing page	

General terms

1 Acknowledgement

The Releasor acknowledges:

(a) the receipt of the Consent Form and the Information Sheet copies of which are attached hereto; and

(b) that the Releasor has read and understood the Consent Form and the Instruction Sheet;

(c) that the Consent Form and the Instruction Sheet form part of this Deed.

2 Release

The Releasor releases and discharges the Crown from all causes of action, suits, claims, liabilities, debts, costs (including legal costs), expenses and demands whatsoever that the Releasor has, or at any time may have, or could, would or might have, but for this Deed in relation to the Research being undertaken by the Researcher or in respect of any act, matter or thing done, permitted, suffered or neglected by the Crown in any way relating to the Research.

3 Terms of Deed

The terms of this Deed do not affect any other agreement or arrangement between the parties that relates to any subject matter other that the Research.

4 Counterparts

This Deed may be executed in any number of counterparts, each of which will be taken to be an original, but all of which will constitute one and the same instrument.

5 Joint and several obligations

Where two or more persons are named as a party in this Deed, their obligations and liabilities under this Deed are joint and several. Every covenant or agreement expressed or implied in this Deed will bind each person jointly and each of them severally.

6 Crown

In this Deed, where the context requires, "Crown" includes the Crown in right of Tasmania and its employees as well as the School and the Principal of the School.

Signing page

Dated: 2013

Signed Sealed and Delivered by)
)
in the presence of:)
) .....
.....)
Signature of witness

.....
Name of witness (block letters)

.....
Address of witness

.....
Occupation

Signed Sealed and Delivered by)
)
in the presence of:)
)
.....) .....
Signature of witness)

.....
Name of witness (block letters)

.....
Address of witness

.....
Occupation

APPENDICES E: PHD EXAMINATION SUBMISSION SHOW

APPENDICES F: CURRICULUM VITAE

Name: Abdul Aziz Zalay @ Zali

Education: Master in Education (Art)
Universiti Pendidikan Sultan Idris (2005)

Bachelor in Design (Industrial),
Faculty of Art and Design,
University Teknologi MARA (1998).

Certificate in Electronic Engineering,
Butterworth Institute of Technology (1994).

Experiences:

1. Demonstrator for Model making (Vehicle Styling) at Department of Mechanical Engineering, Kulliyyah of Engineering, IIUM. (2004).
2. Model making for the Malaysian Examinations Council Building (MEC). (2004).
3. Presentation for Industrial Design Course at Malaysia National Art Gallery.(2001)
4. Interior design for Museum 'Padi' at Langkawi Kedah, Malaysia.(1998)

Research:

1. Integrate multimedia interactive to develop students' potentials in Poster Design. Experimental Research. (2006).
2. 'Developing and evaluating students' motivational level and perceptions using computer aided learning software', 'Introduction to poster design'. (2006).

Group research:

1. Virtual Drawing Using Painter V.7 Among UPSI, Art Education's Students. (2007)
2. Batik on Glass. (2006)

Exhibitions :

1. Seeing Double – Tanjong Malim Perak, Malaysia. (2011)
2. Seeing Double – Hobart Tasmania, Australia. (2010)

Award :

1. Bronze Medal – 35th The International Exhibition of Inventions, New Techniques and Products of Geneva 2007
2. Gold Medal – 17th International Invention, Innovation, Industrial Design Technology (ITEX) 2006 , KL Convention Centre, Malaysia.